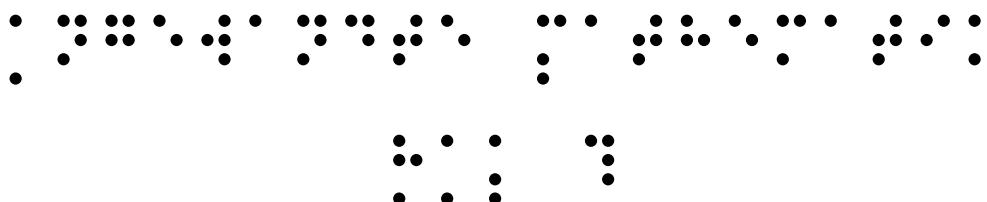




Tastbare Versionen ausgewählter Grafiken aus dem Schulbuch

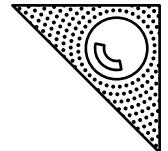
Angewandte Mathematik HAK 4



Grafiken: Tomáš Batha

LEMA - Lehr- und Lernmaterialien

Hergestellt von der Abteilung für Inklusion und Lehrmittel am Bundes-Blindeninstitut Wien,
Wittelsbachstraße 5, 1020 Wien, Tel.: 01/728 08 66-405, 406, lmz@bbi.at, www.bbi.at



Ang. Mat. HAK4

Angewandte
Mathematik
Hochschule Anhalt

HAK Band 4
Differentialrechnung
Änderungsraten und Steigung

1. Differentialrechnung, Änderungsraten und Steigung

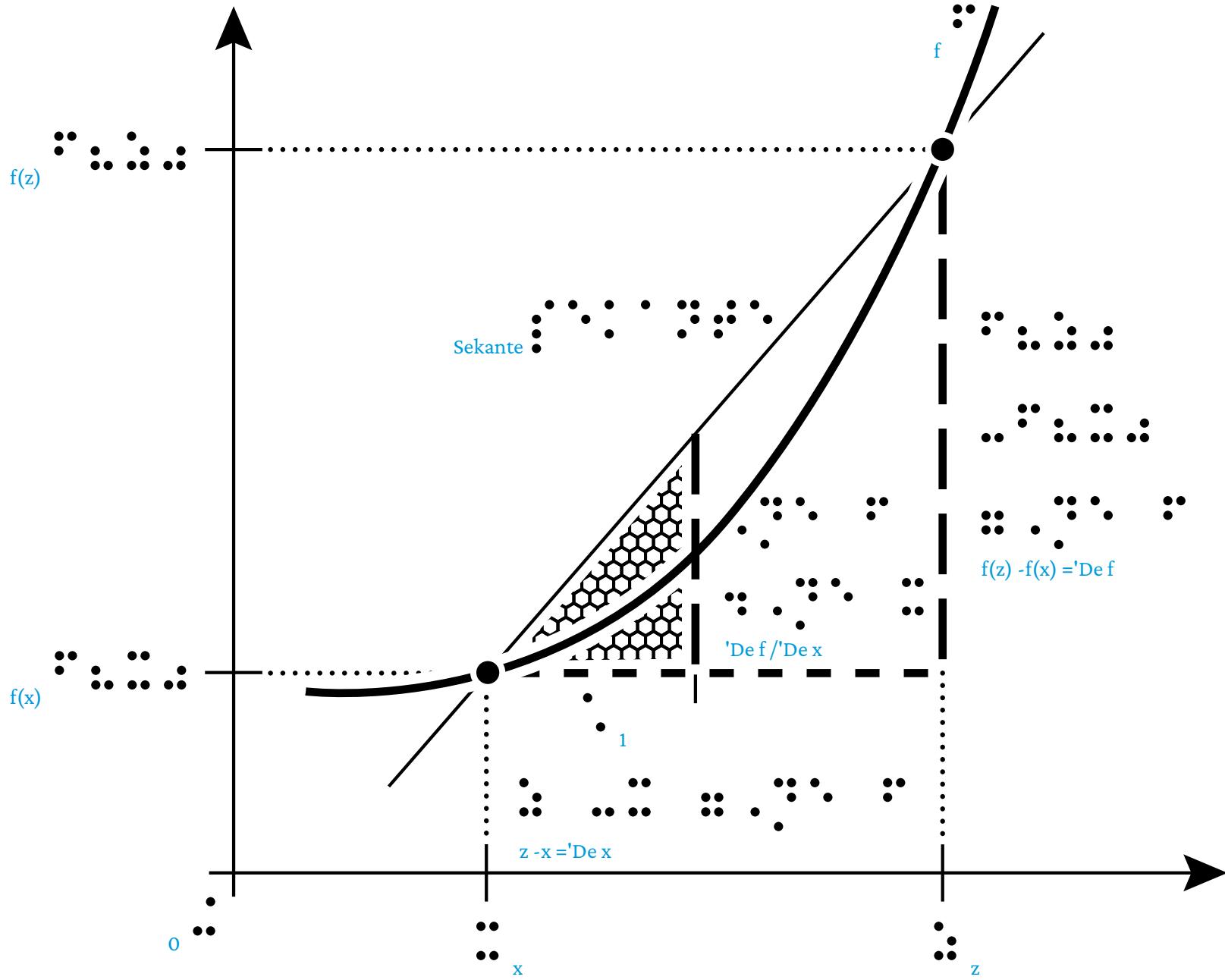
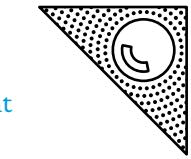
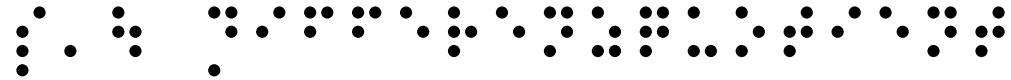
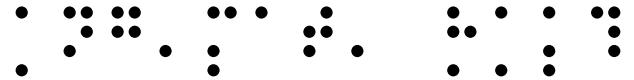
Angewandte Mathematik

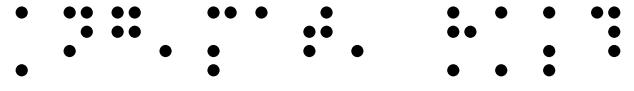
HAK Band 4

1.

Differentialrechnung

Änderungsraten und Steigung

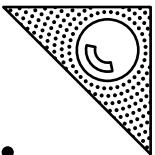




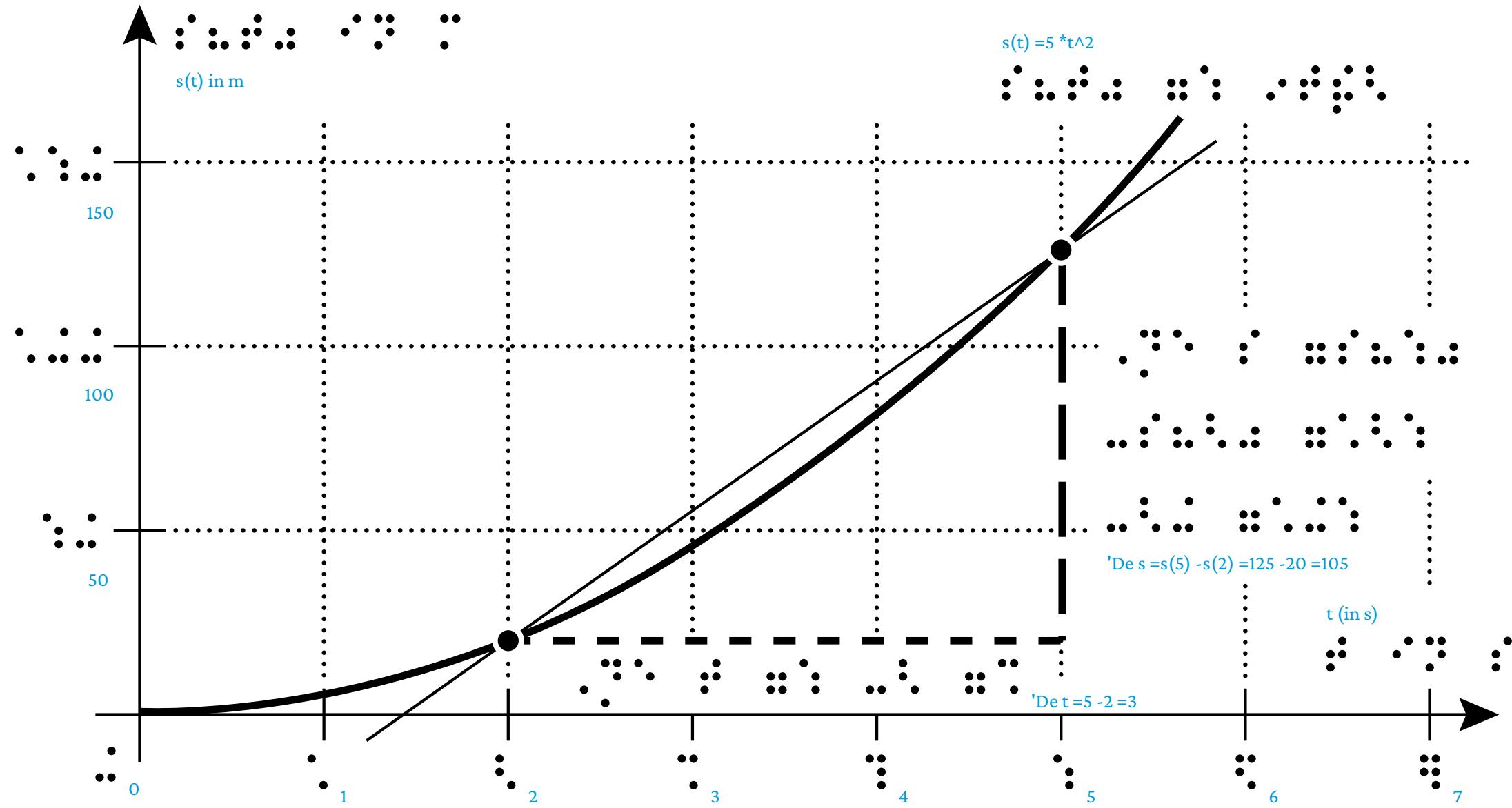
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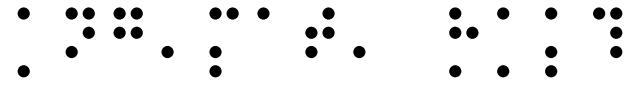


S.12 1/2

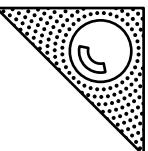


Mittl. Geschwindigkeit im Zeitint. [2;5]



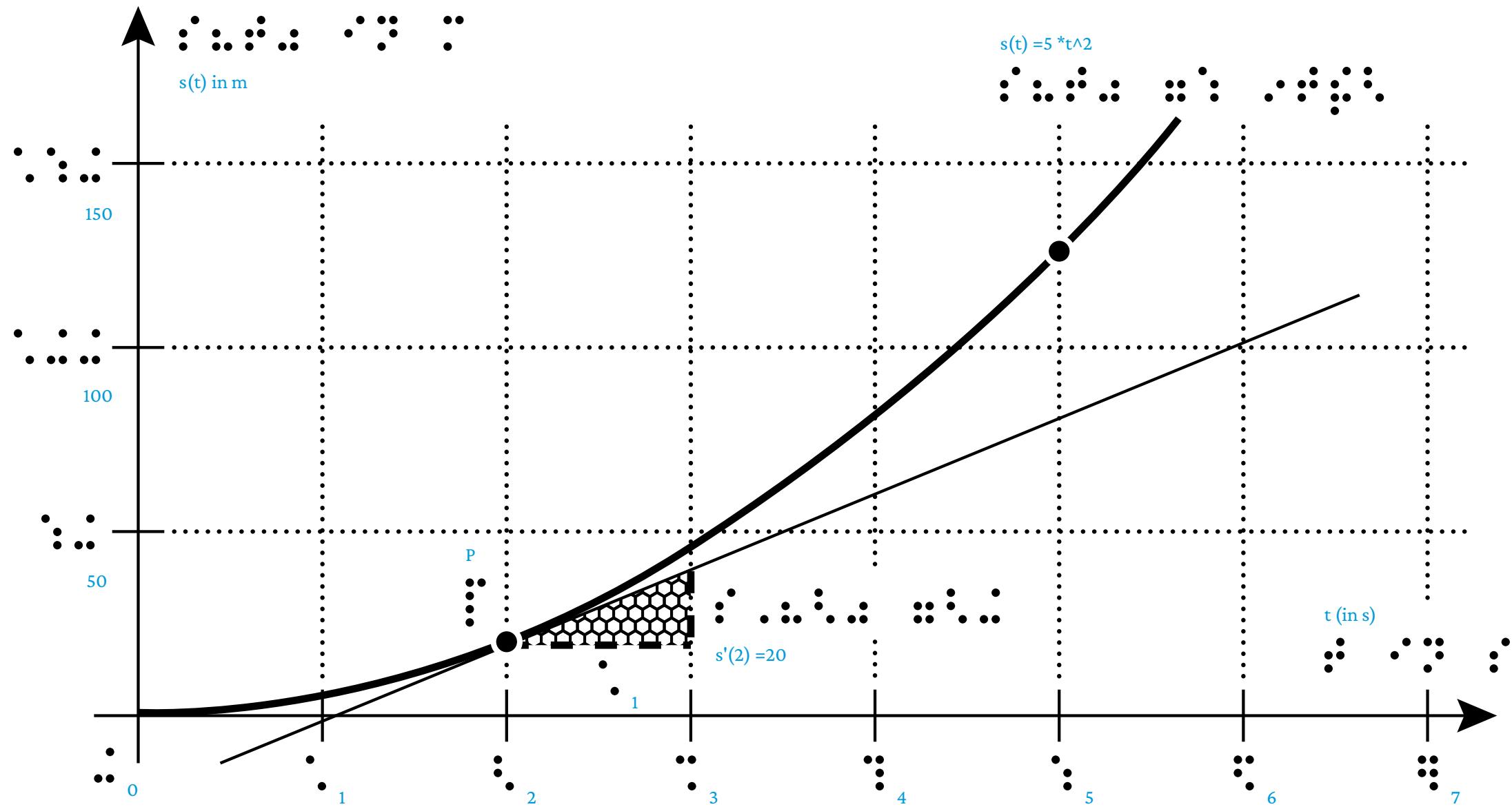


Ang. Mat. HAK4



S.12 2/2

Momentangeschwindigkeit zum Zeitpunkt 2



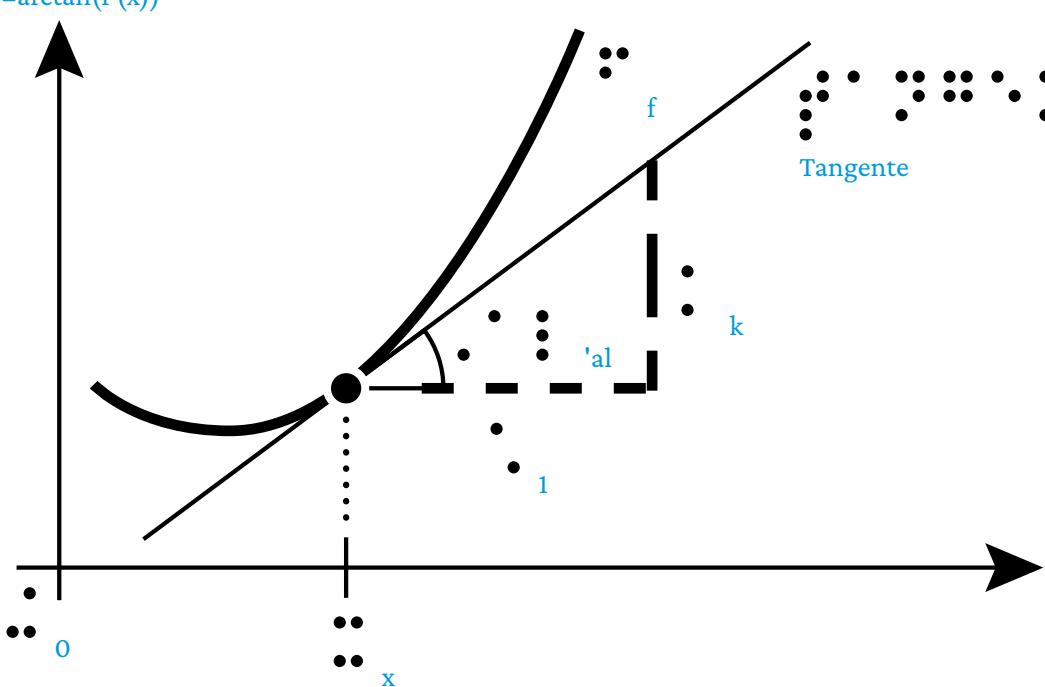
Ang. Mat. HAK4



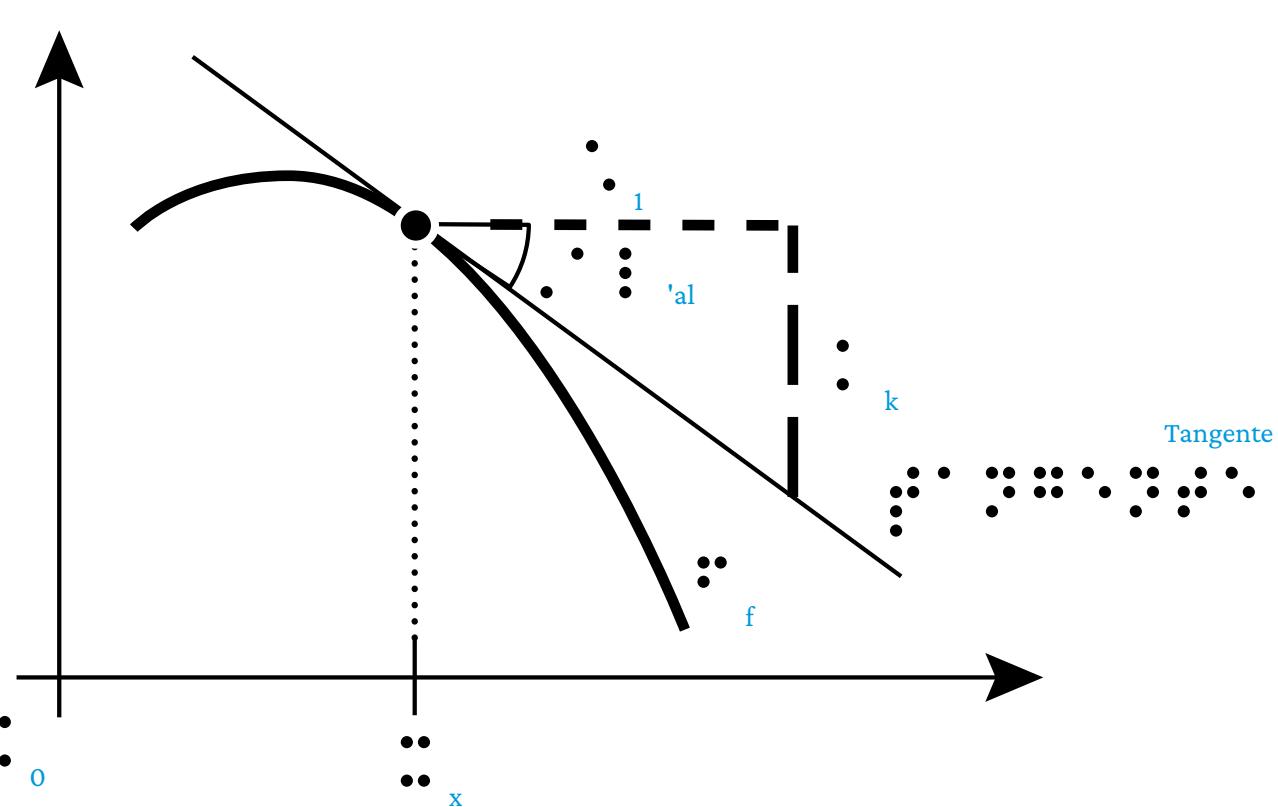
S.12 Satz

$f'(x) = k = \tan(\alpha)$

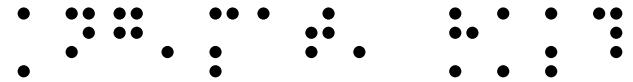
$\alpha = \arctan(k) = \arctan(f'(x))$



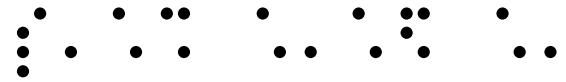
positive Steigung: $k > 0, \alpha > 0$



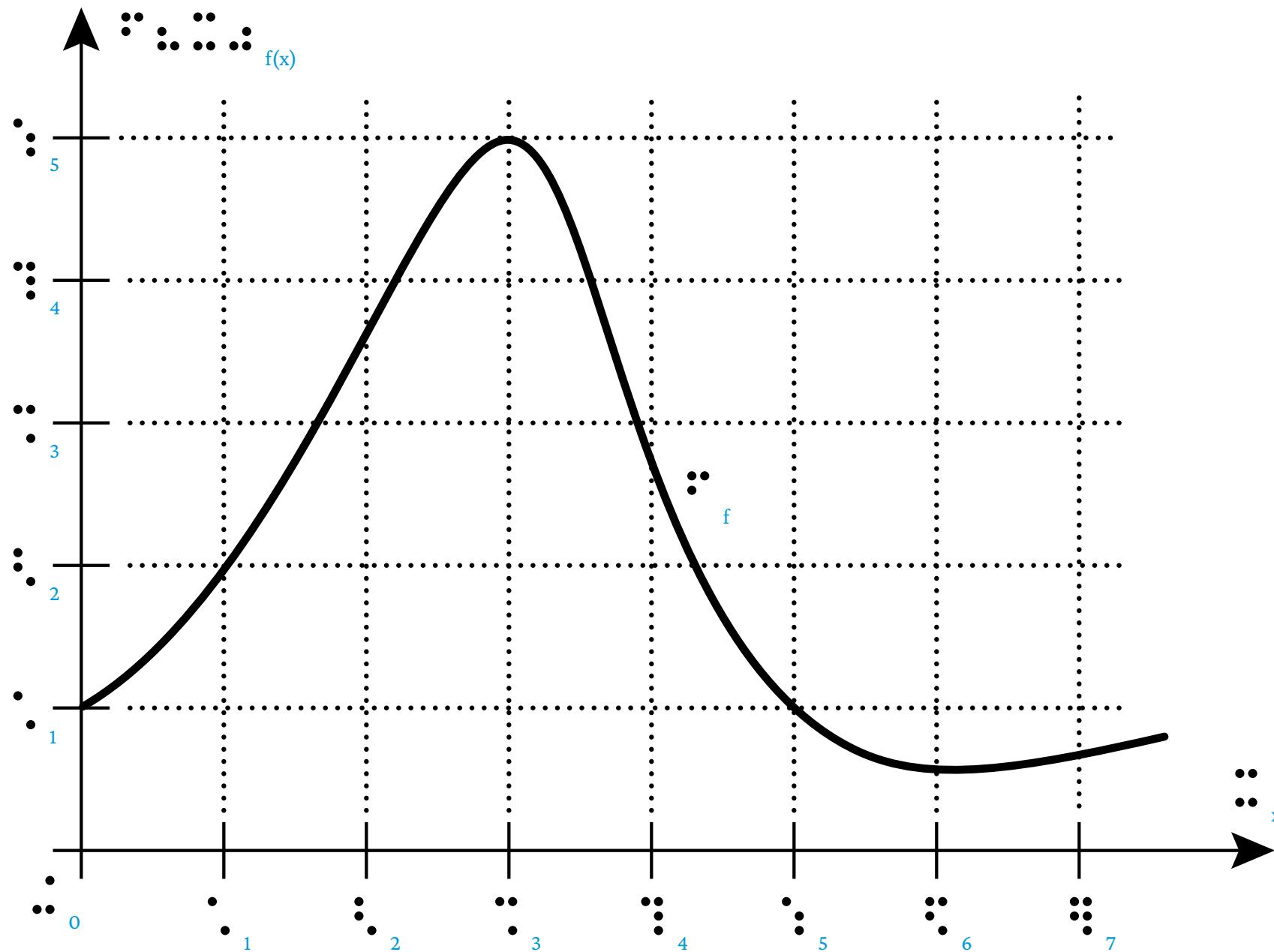
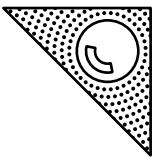
negative Steigung: $k < 0, \alpha > 0$

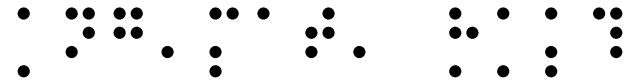


Ang. Mat. HAK4

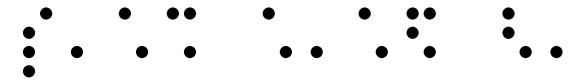


S.13 1.16 1.

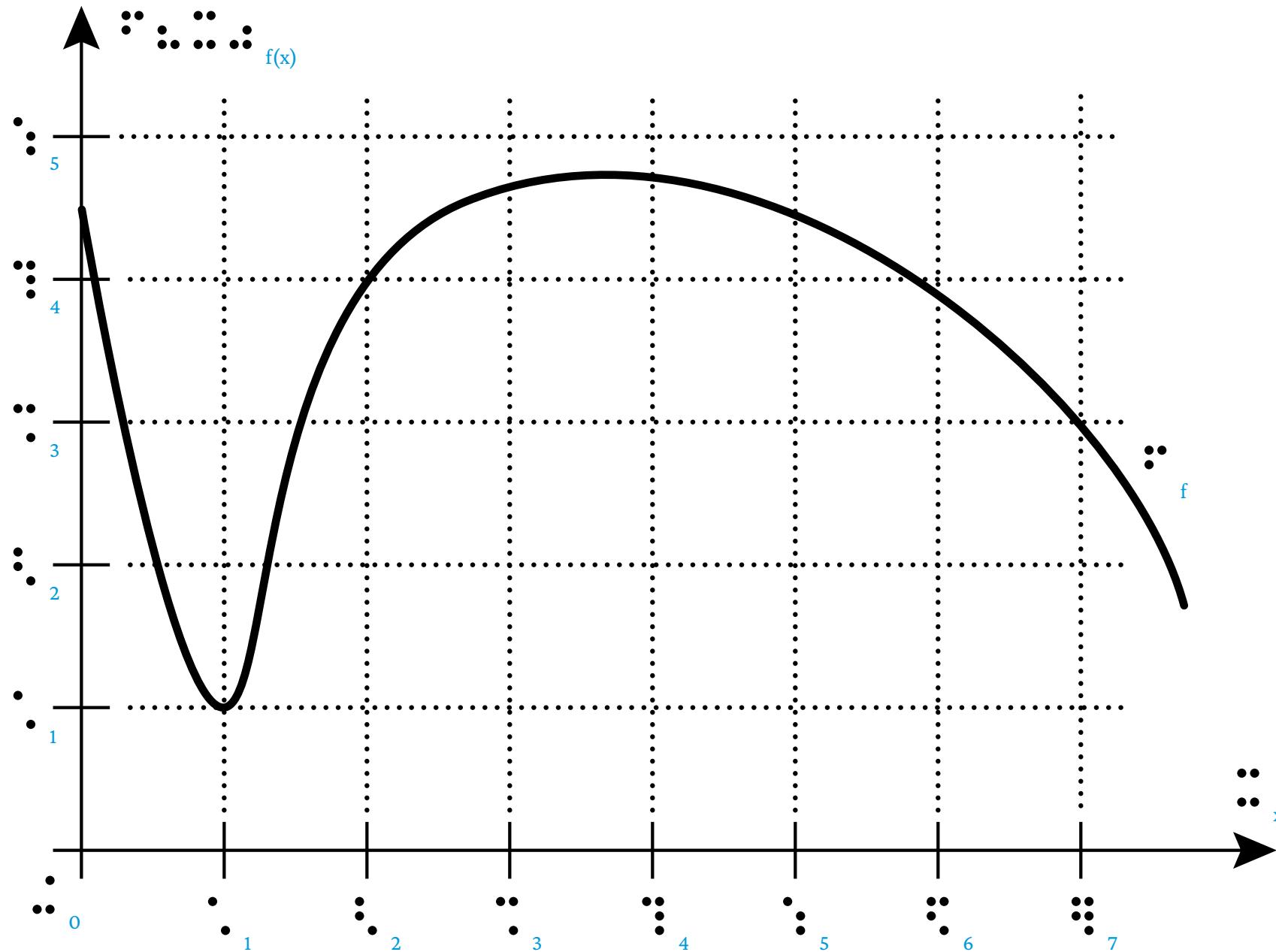
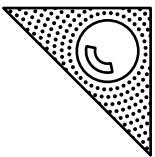


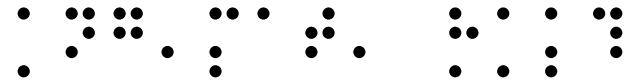


Ang. Mat. HAK4

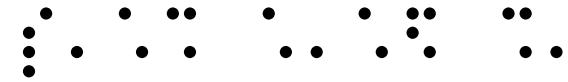


S.13 1.16 2.

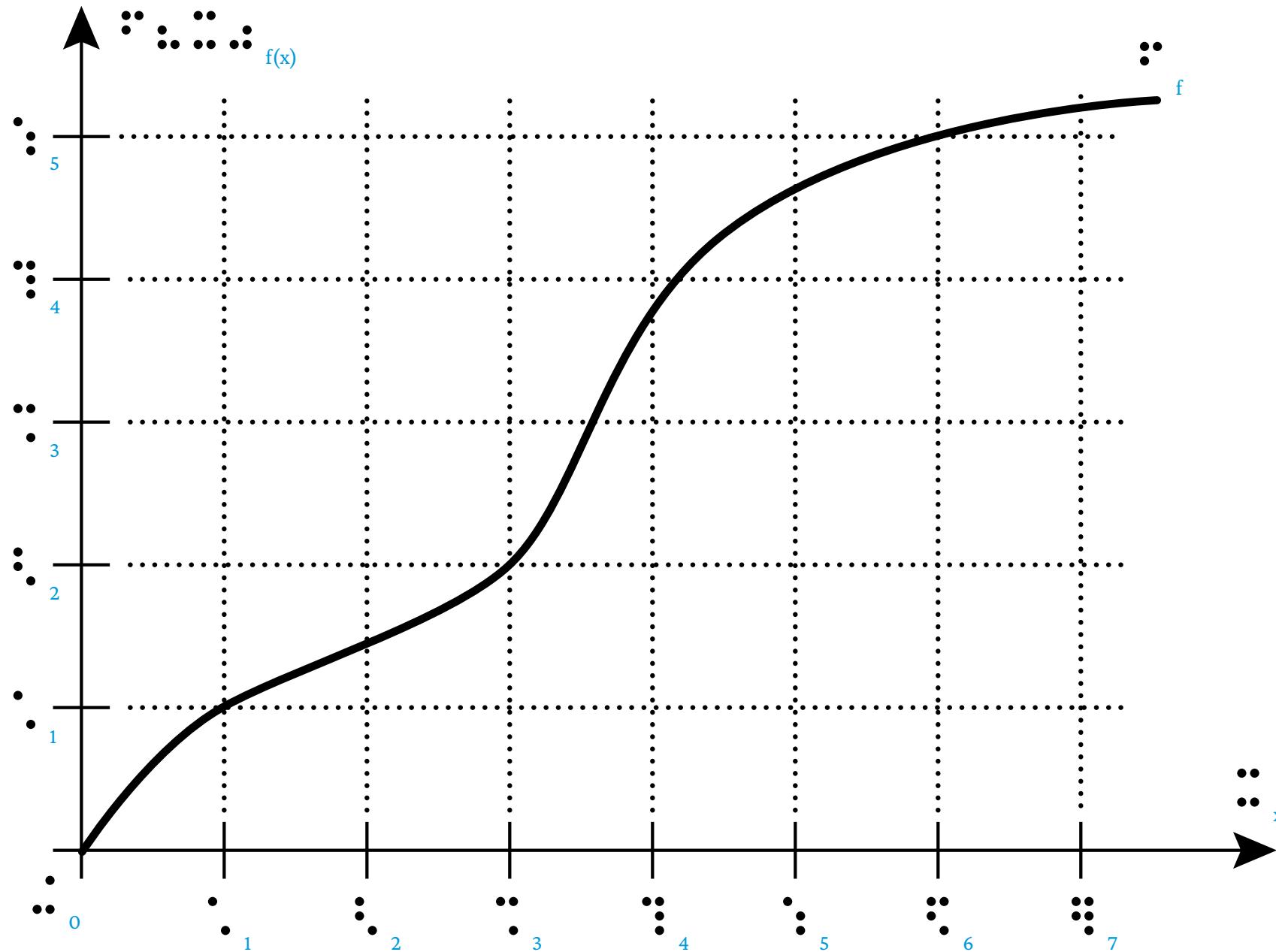
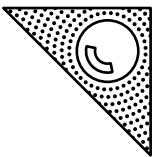


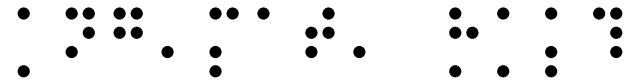


Ang. Mat. HAK4

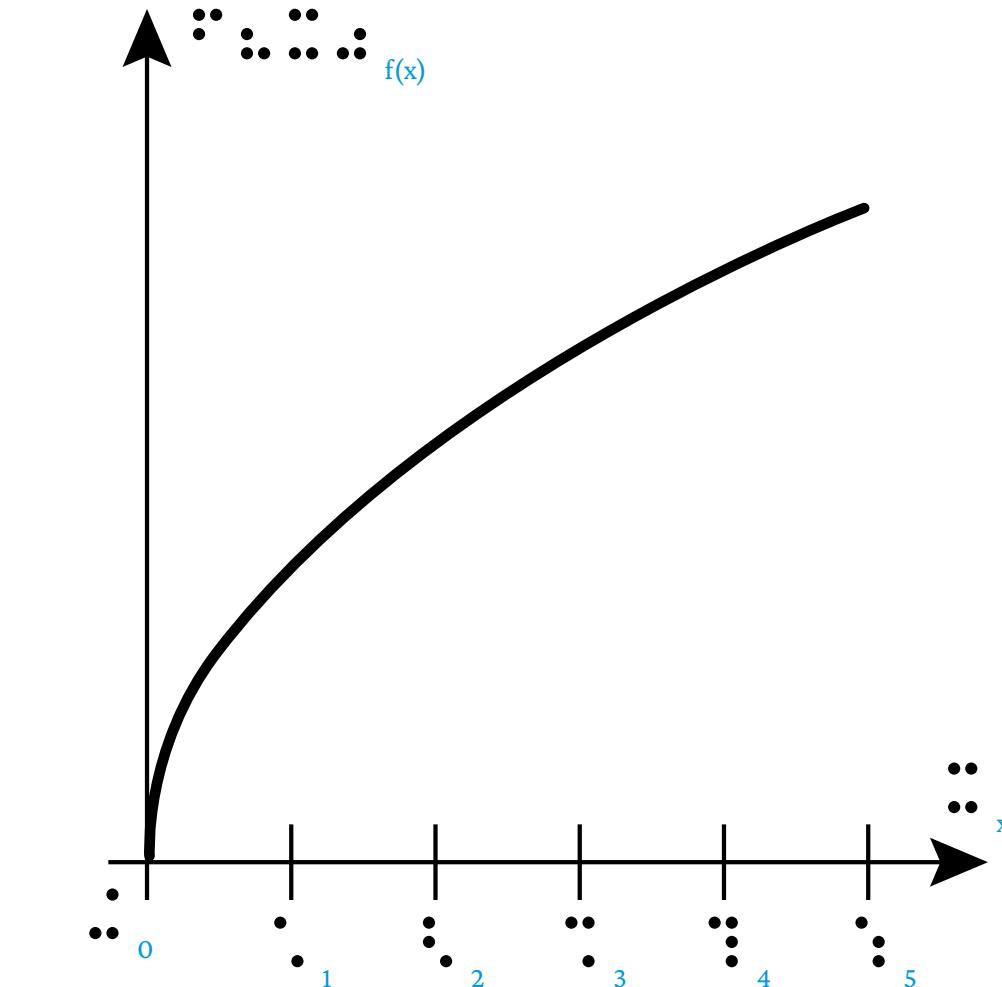
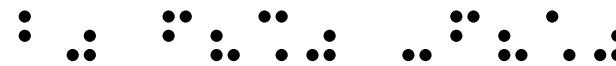
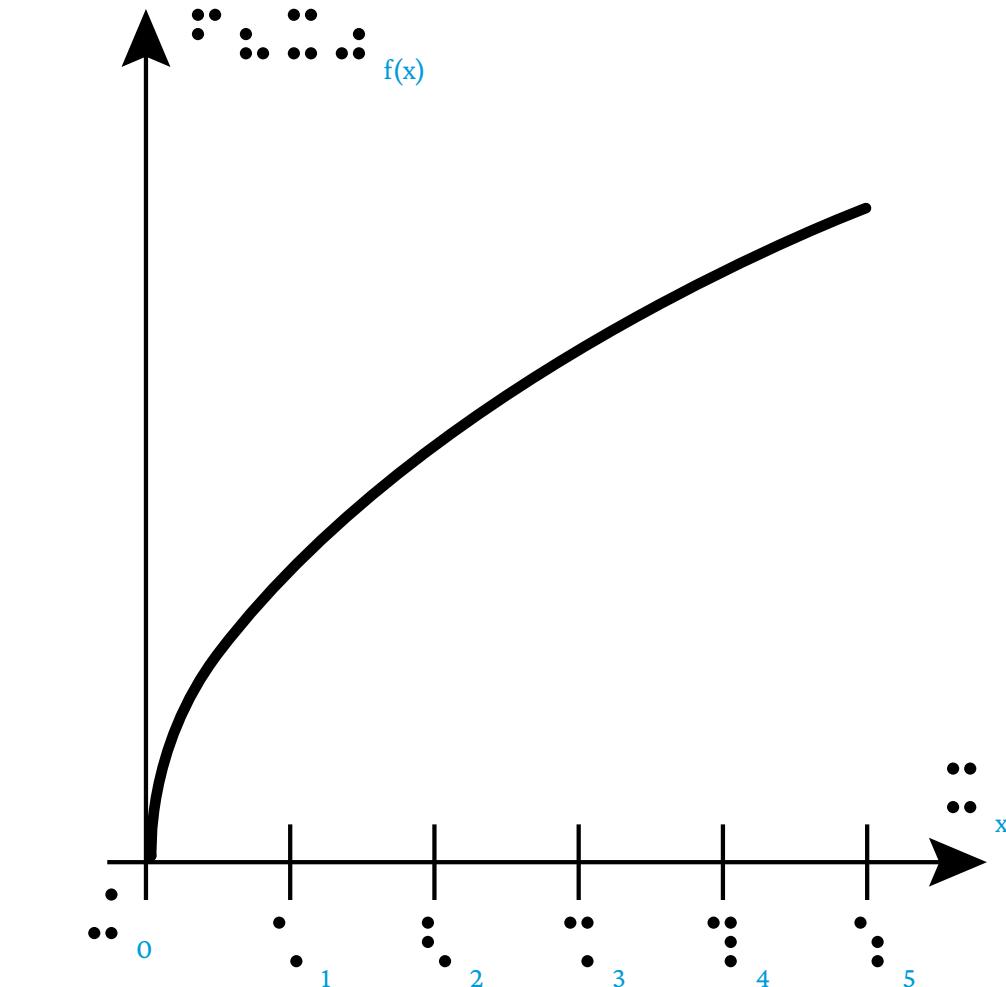
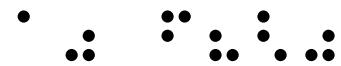
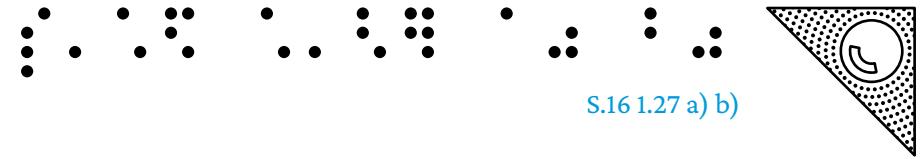


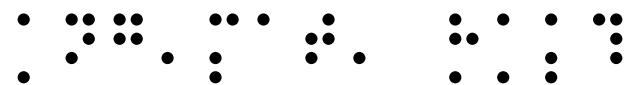
S.13 1.16 3.



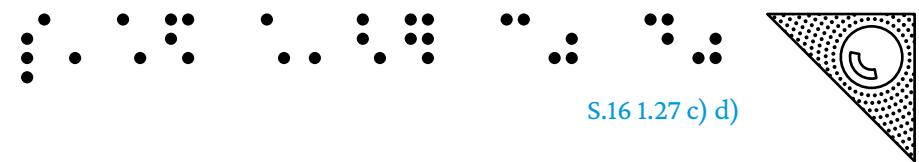


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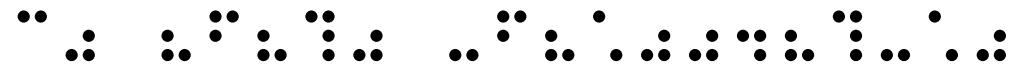




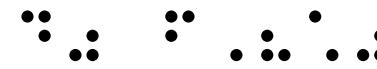
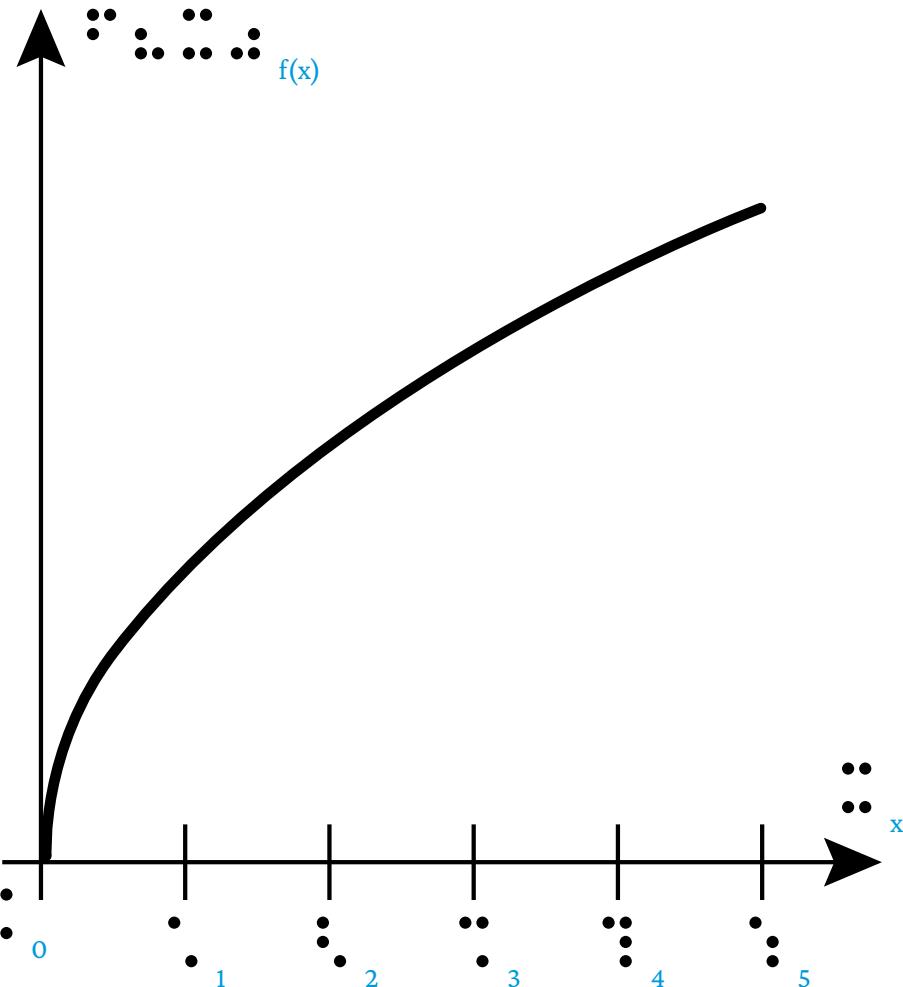
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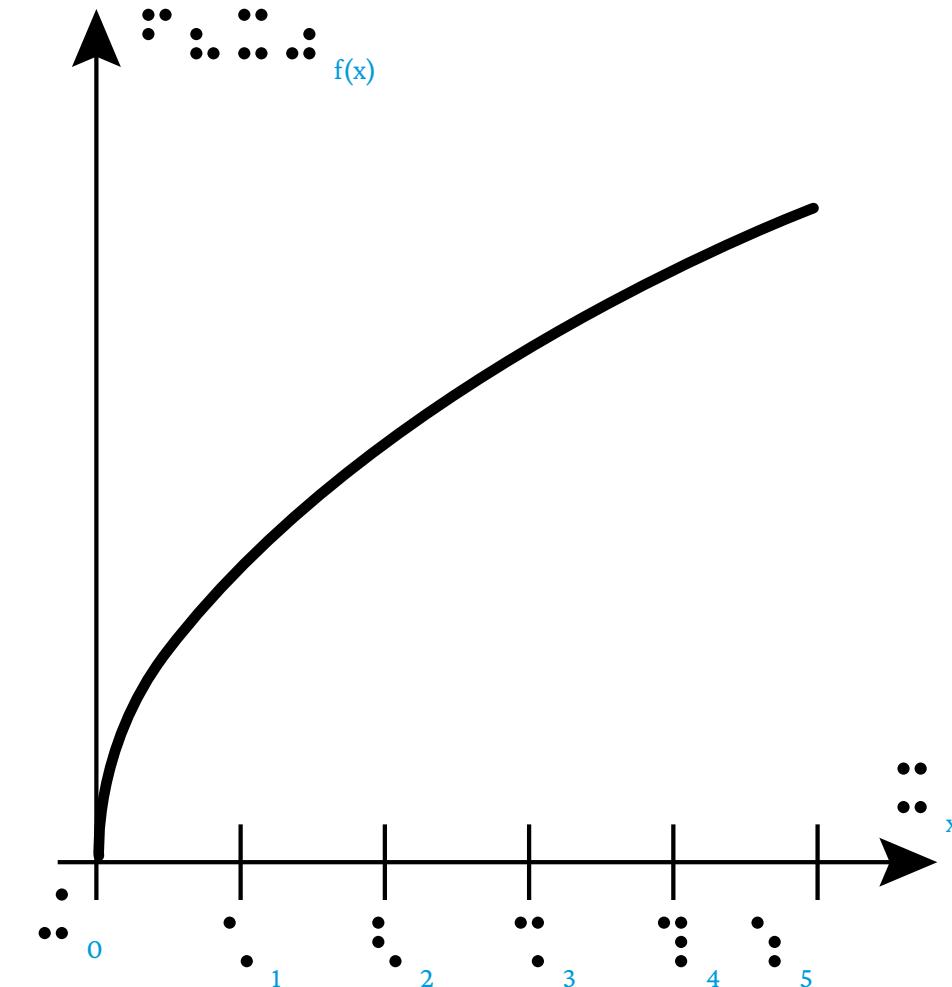
S.16 1.27 c) d)



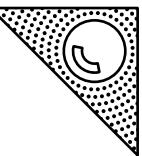
c) $(f(4) - f(1))/(4-1)$



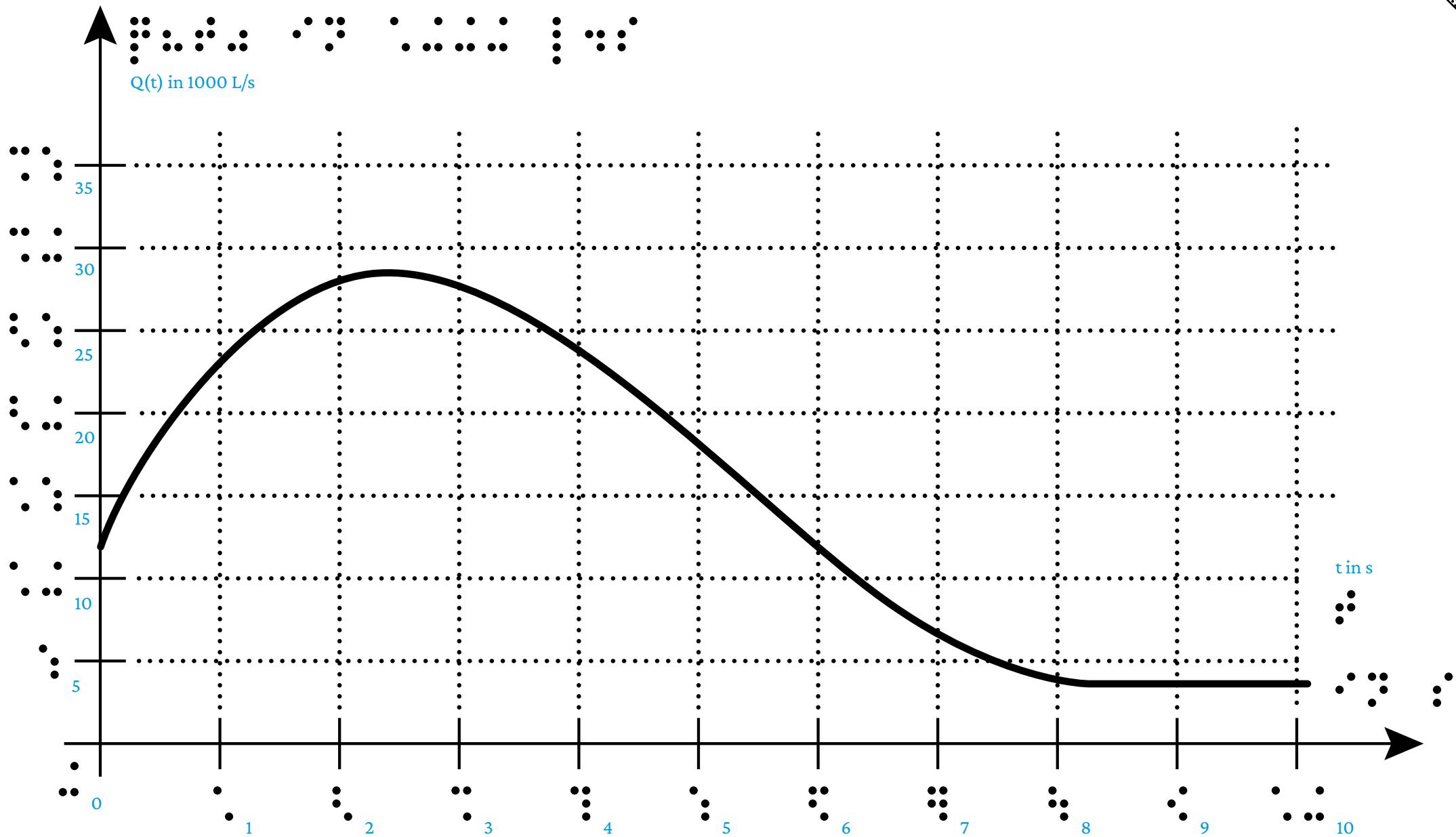
d) $f'(1)$

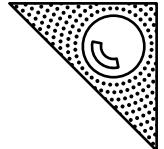


Ang. Mat. HAK4



S.17 1.34





Ang.Mat. HAK4

The image shows a sequence of 15 black dots arranged in two rows. The top row contains 7 dots, and the bottom row contains 8 dots. The dots are arranged in a pattern that suggests a sequence or a code. The arrangement is as follows: Row 1: Dots at (1,1), (2,1), (3,1), (4,1), (5,1), (6,1), (7,1). Row 2: Dots at (1,2), (2,2), (3,2), (4,2), (5,2), (6,2), (7,2), (8,2).

2. Funktionen und Ableitungsfunktionen

Angewandte Mathematik

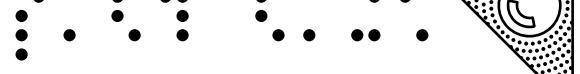
HAK Band 4

2.

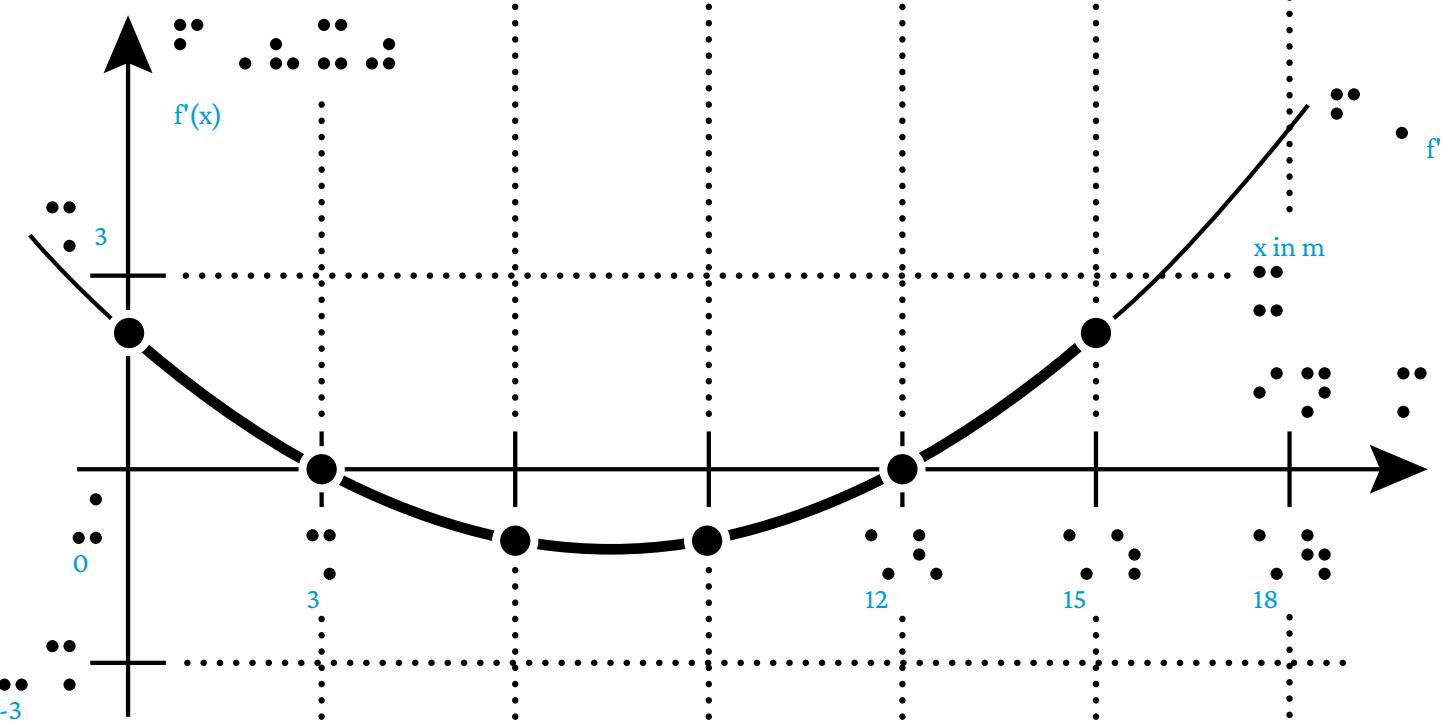
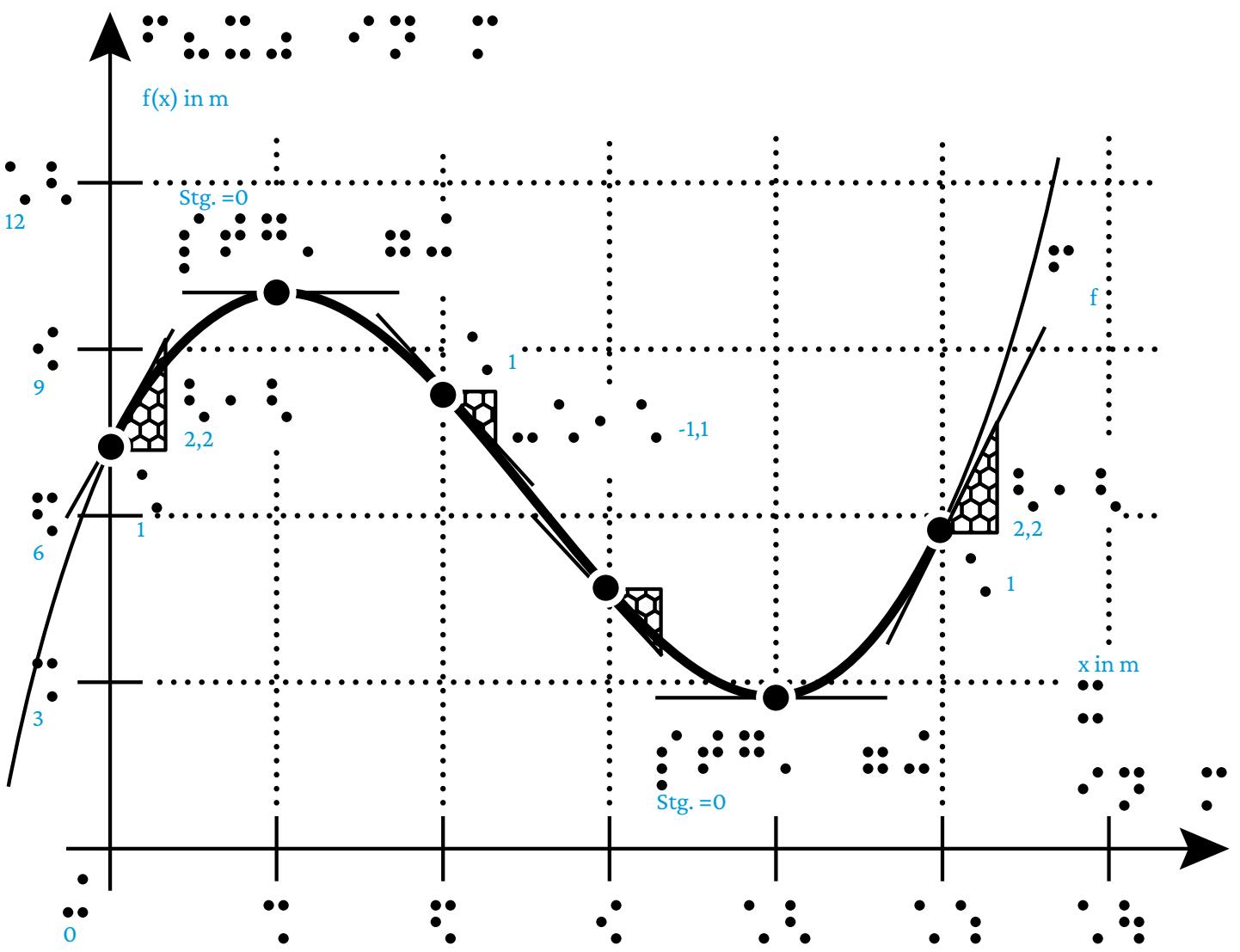
Funktionen und Ableitungsfunktionen

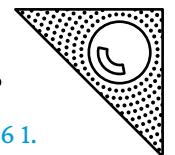


Ang. Mat. HAK4

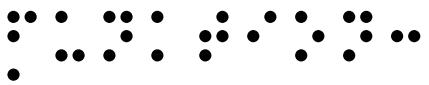


S.24 2.01

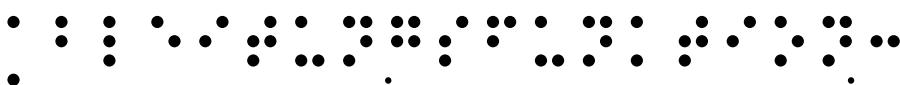
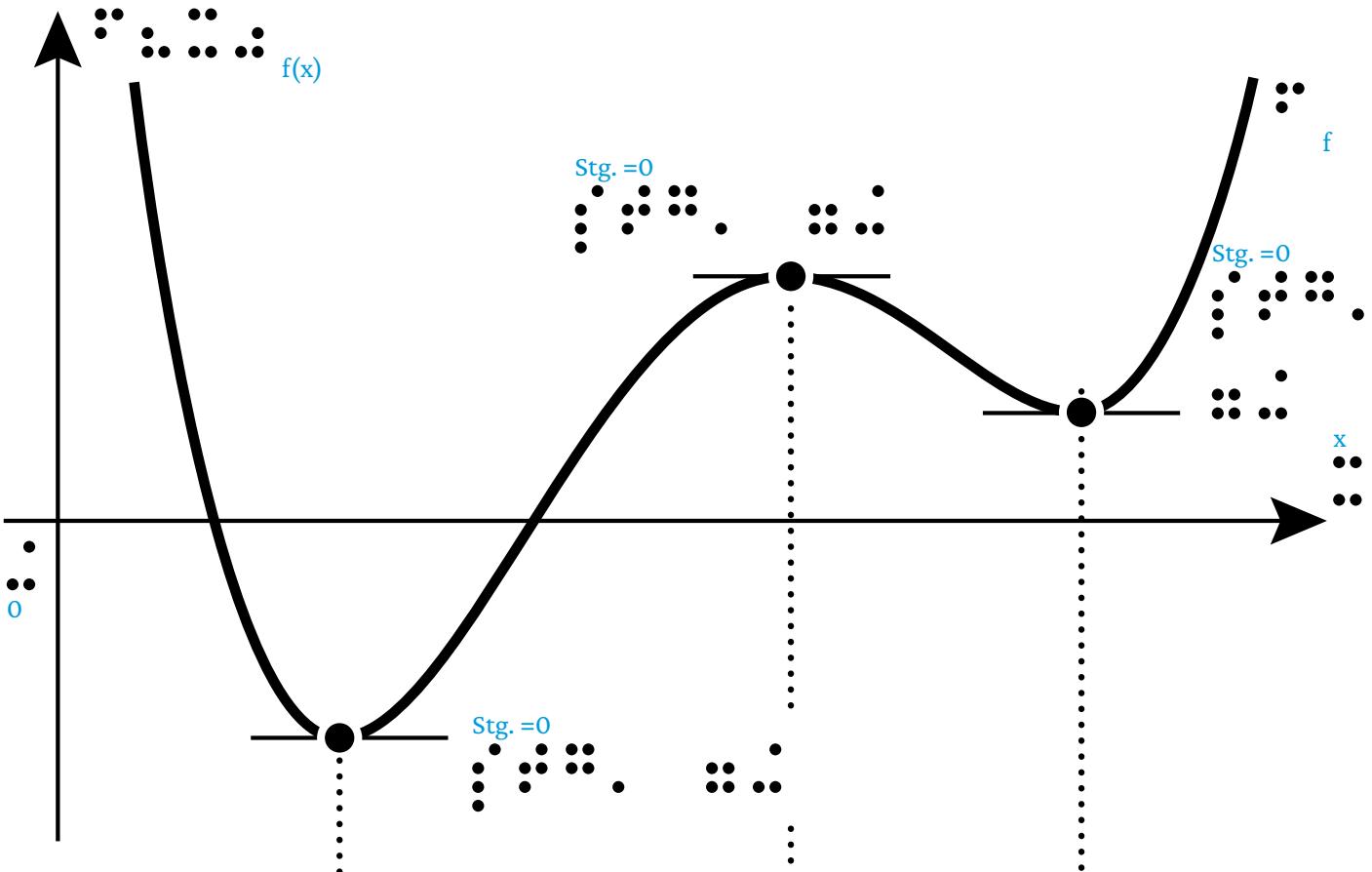




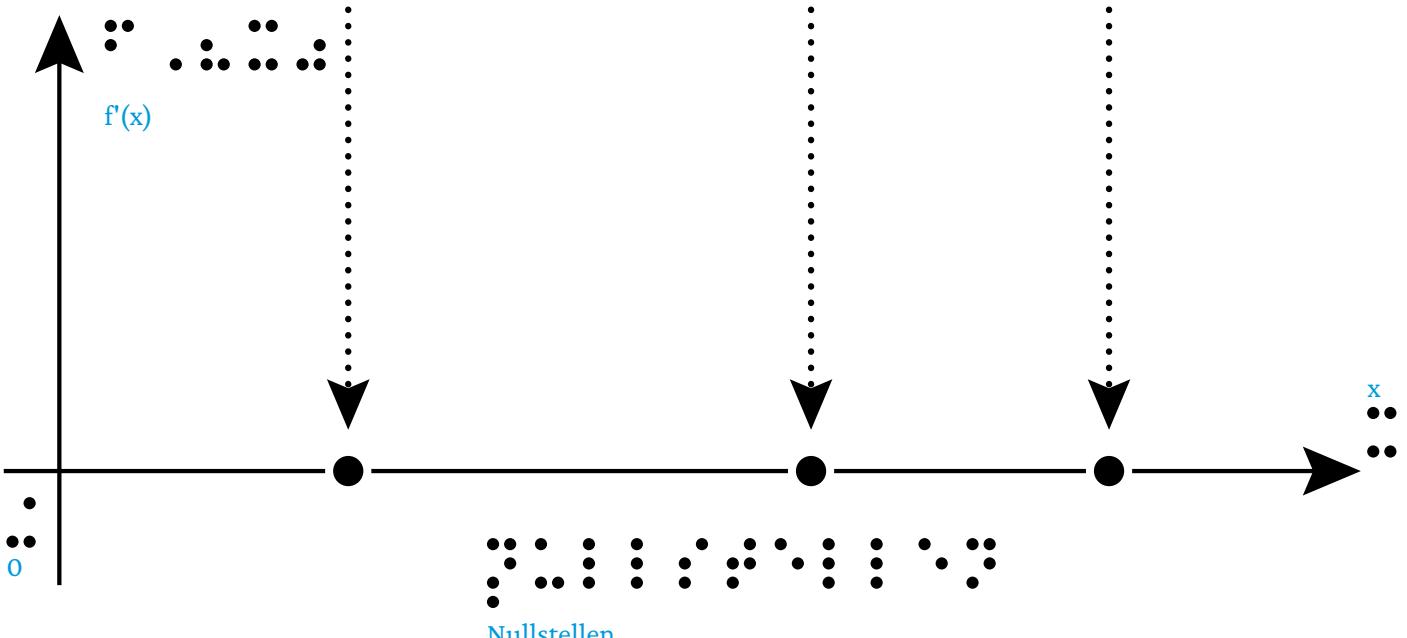
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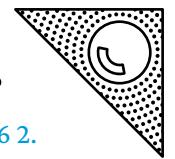


Funktion:



Ableitungsfunktion:

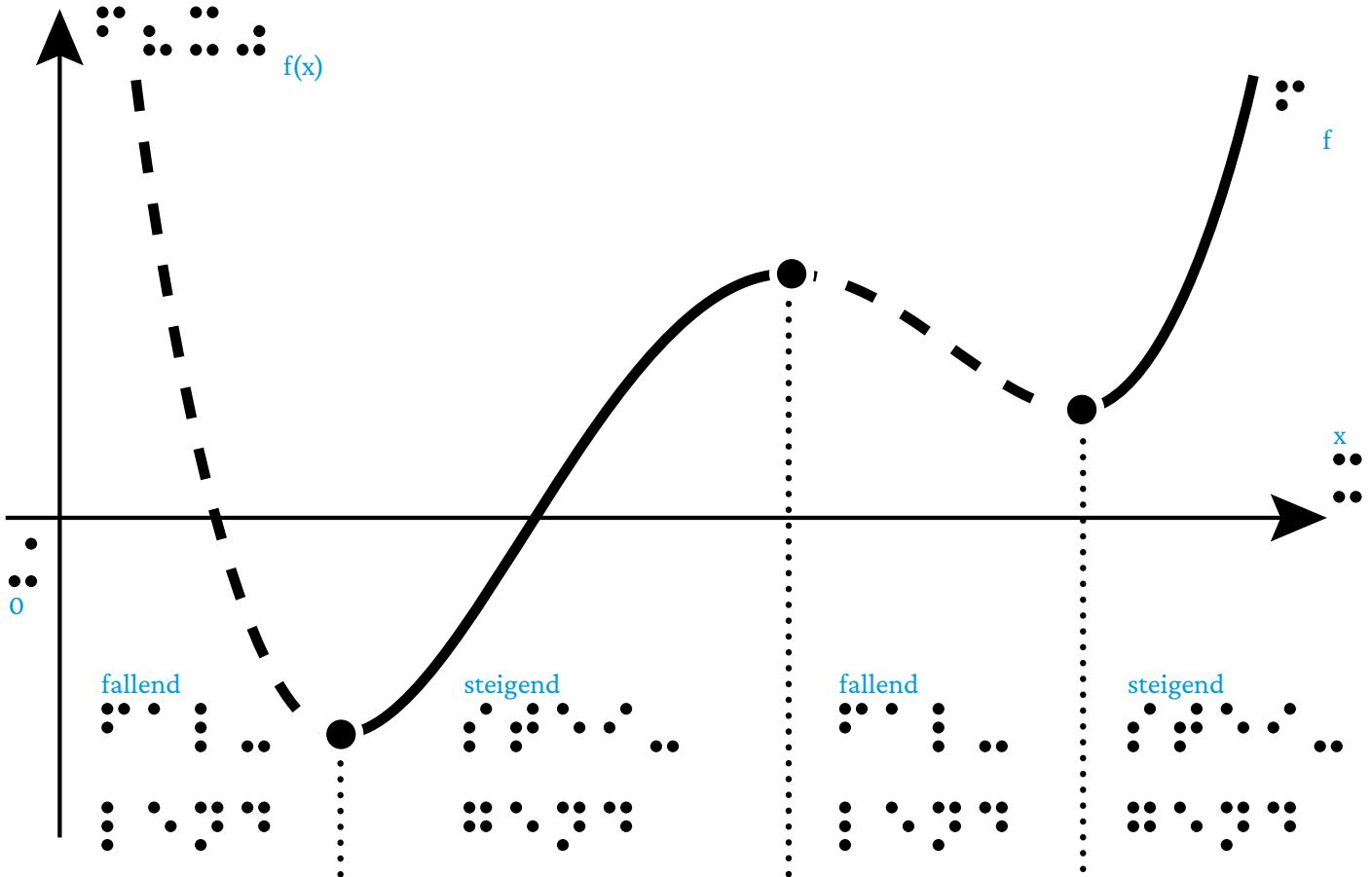




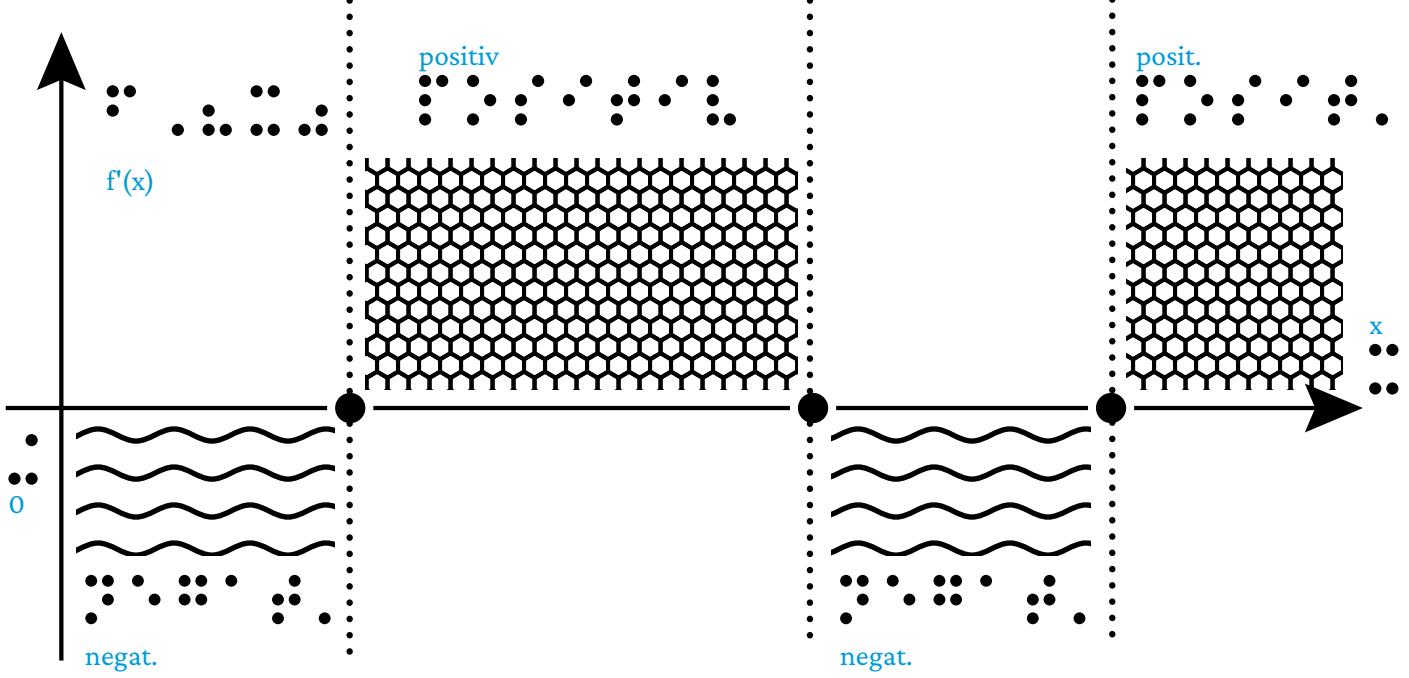
Grafisches Ableiten 1.

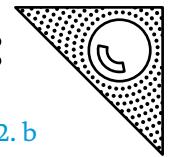
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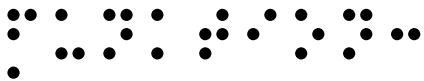


Ableitungsfunktion:

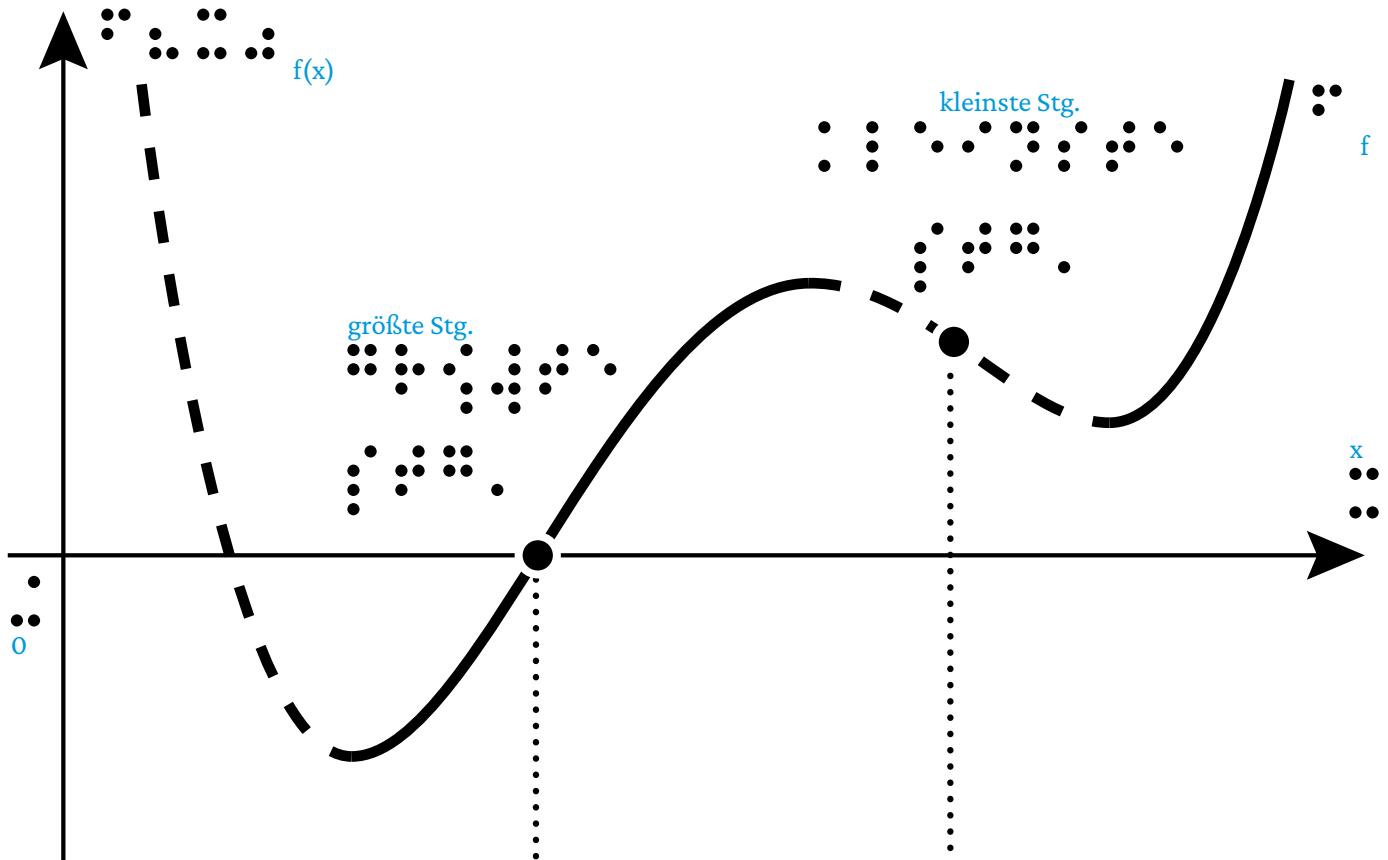




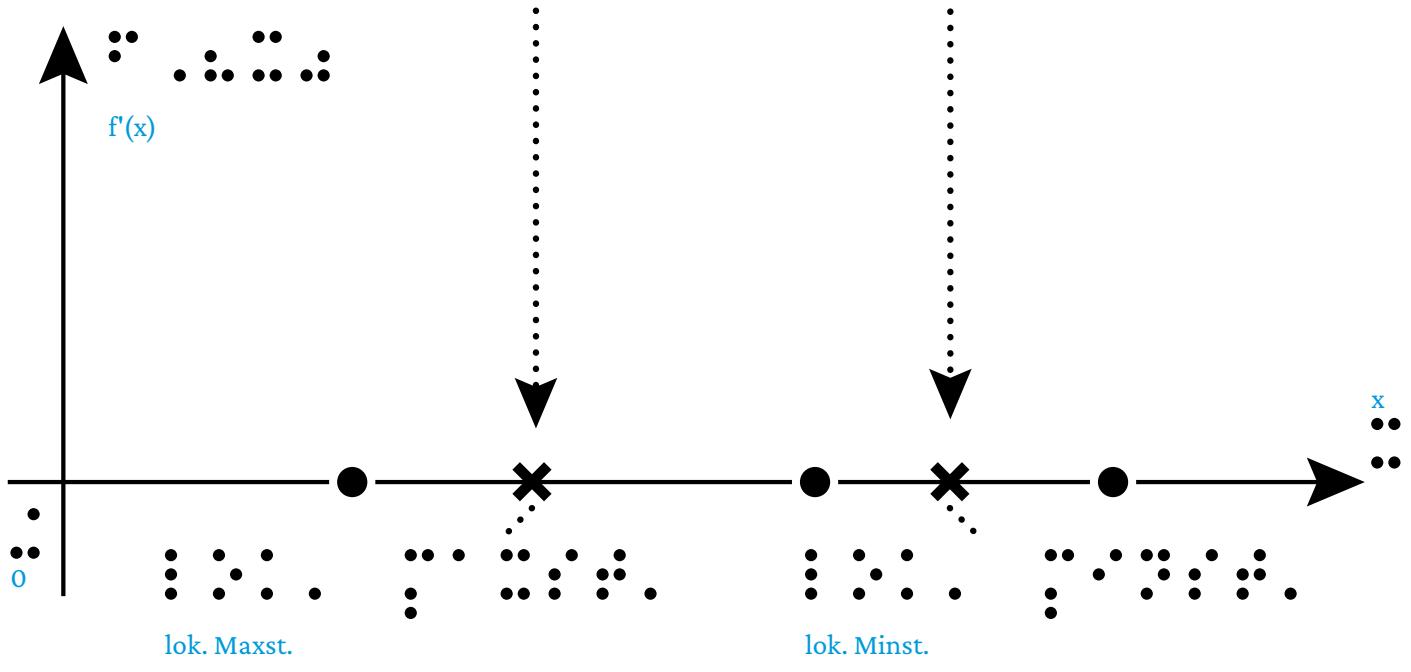
Grafisches Ableiten 1.



Funktion:

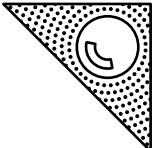


Ableitungsfunktion:



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S.28 Ableitungsregeln 1/3



Ableitung von konstanten Funktionen

Regel:

Regel:

$f(x) = c$ ($c \in \mathbb{R}$)

$f'(x) = 0$

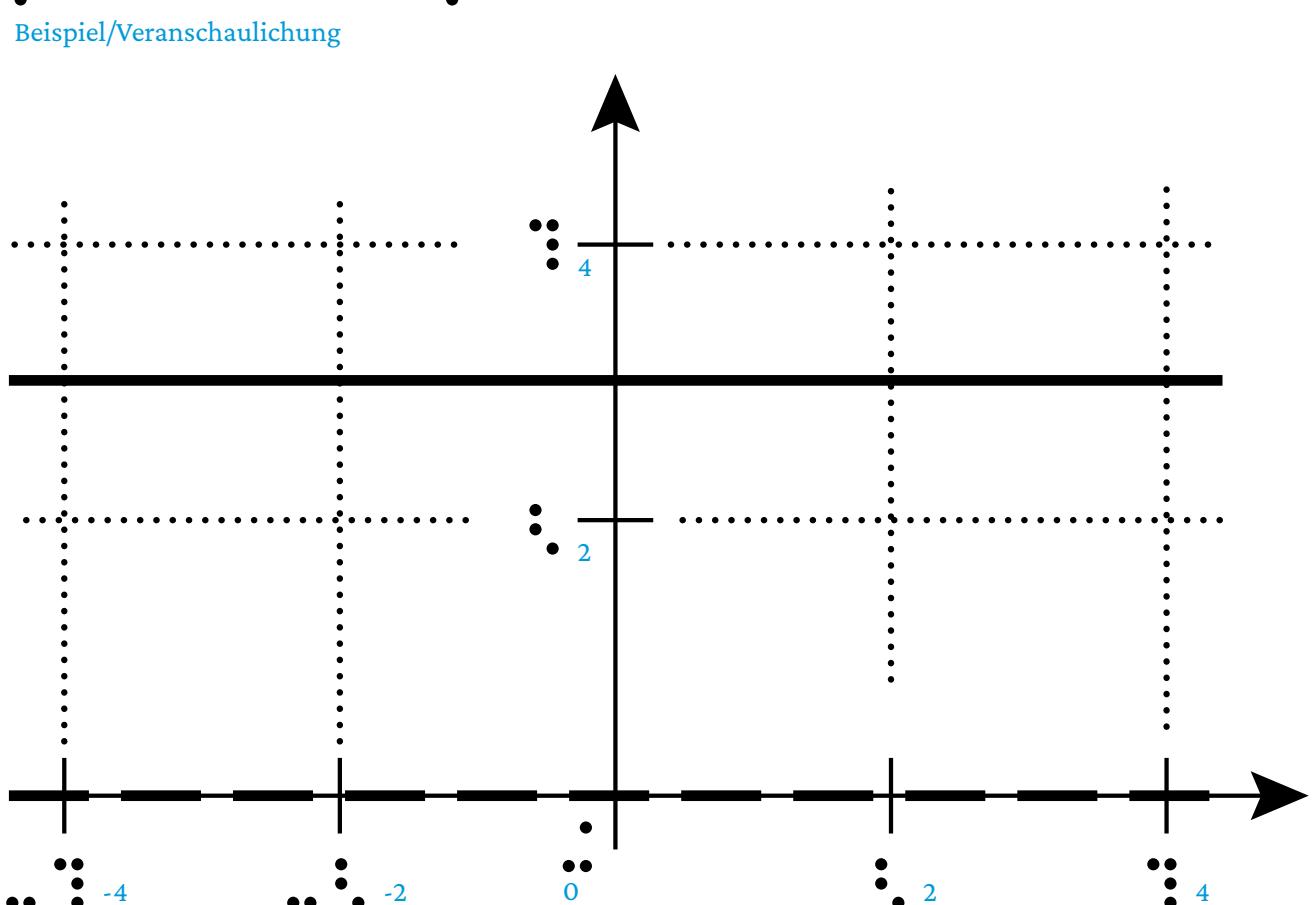
$f(x) = 3$

$f'(x) = 0$

$f(x) = 0$

$f'(x) = 0$

Beispiel/Veranschaulichung



Ang. Mat. HAK4

Ableitung von Potenzfunktionen

Regel:

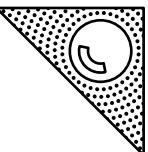
$f(x) = x^n$ mit $n \in \mathbb{R}$

$f'(x) = n \cdot x^{(n-1)}$

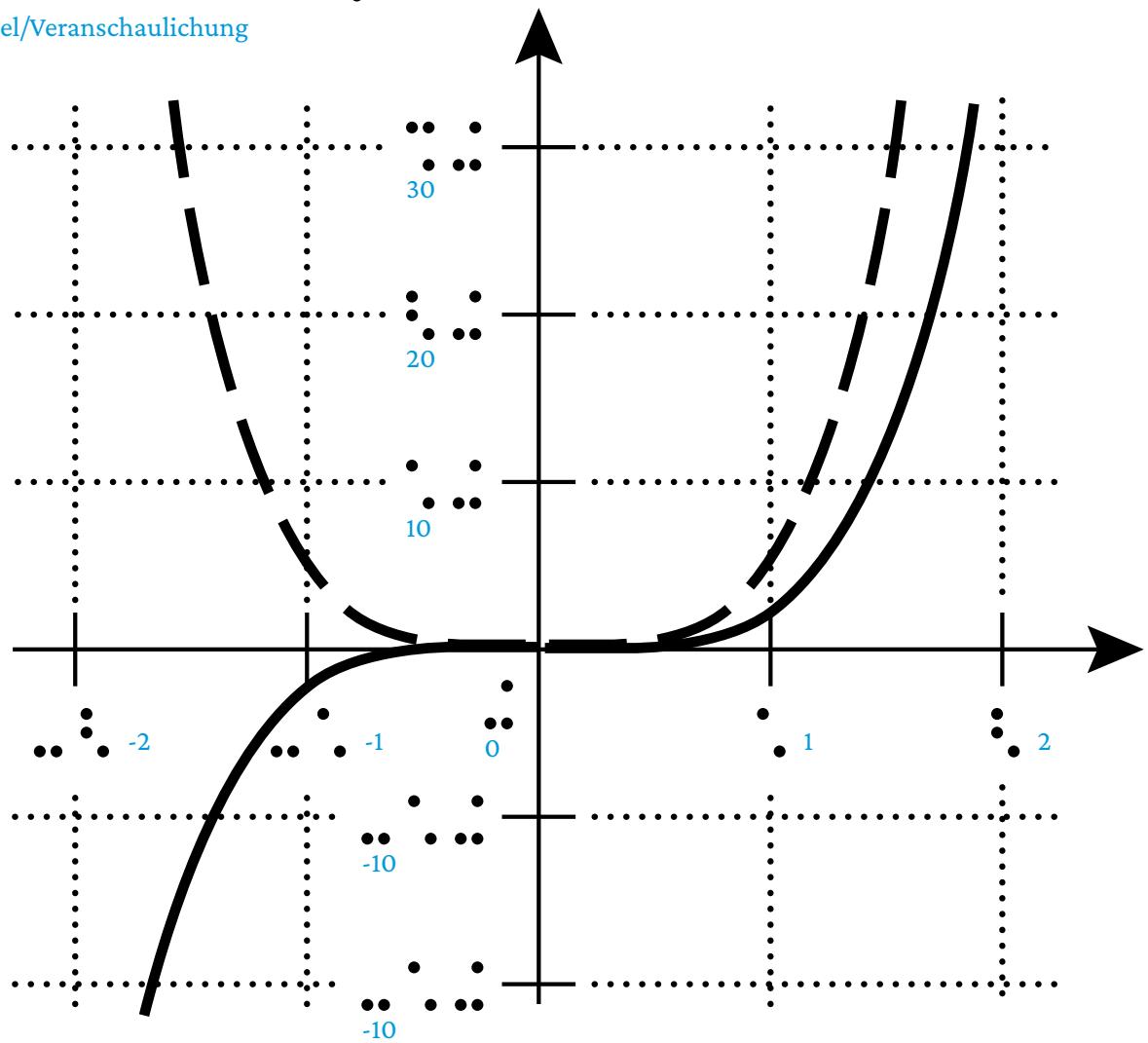
$f(x) = x^5$

$f'(x) = 5 \cdot x^4$

S.28 Ableitungsregeln 2/3

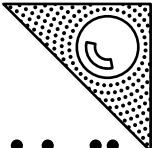


Beispiel/Veranschaulichung



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S.28 Ableitungsregeln 3/3



Ableitung der natürliche Exponentialfunktion

Regel:

Regel:

Beispiel/Veranschaulichung

$f(x) = e^x$

$f'(x) = e^x$

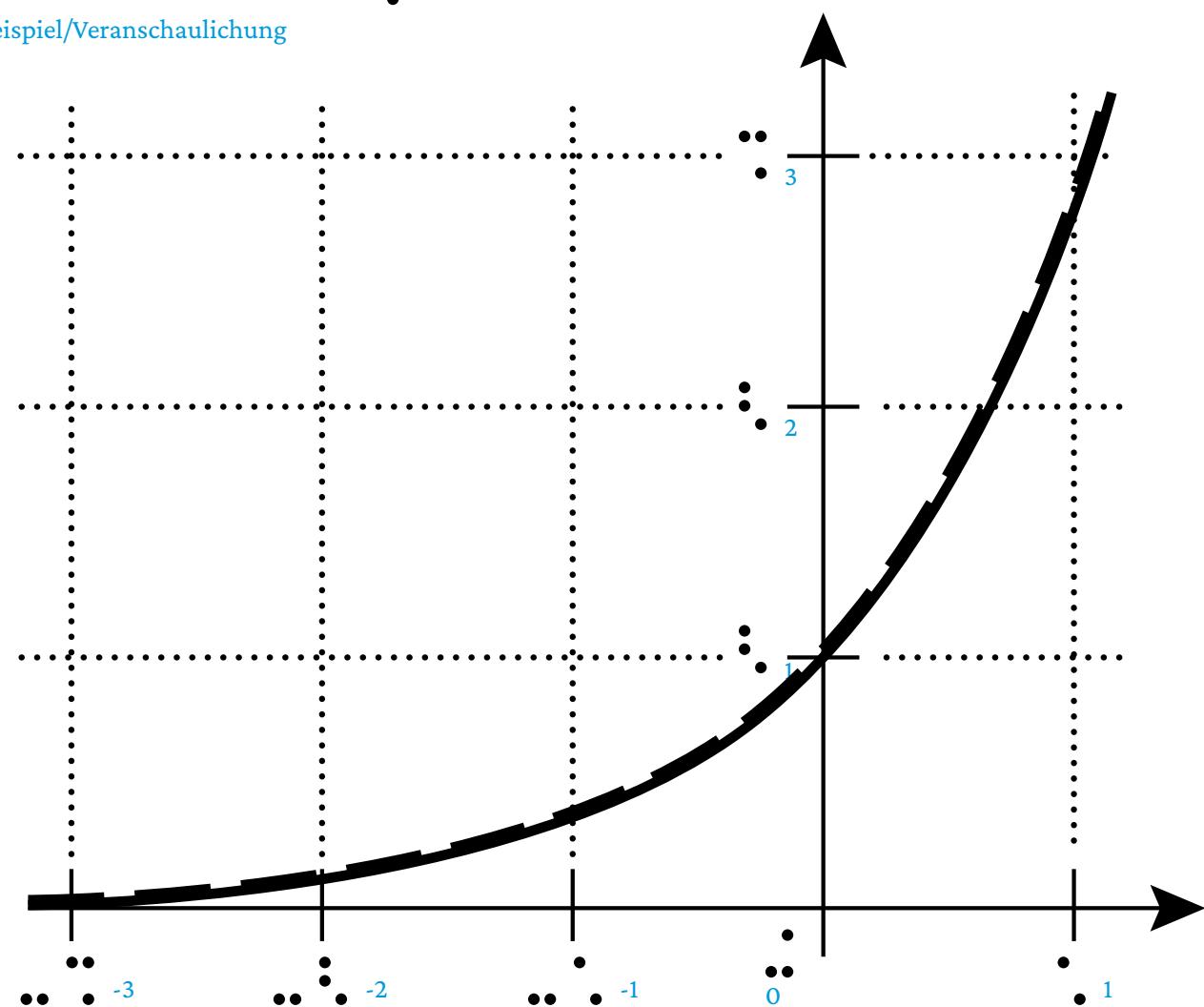
$f''(x) = e^x$

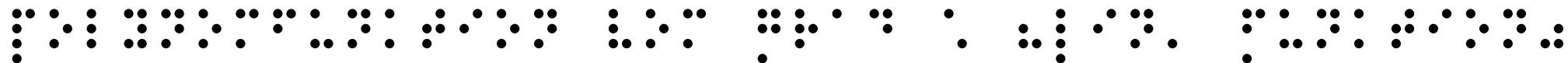
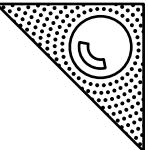
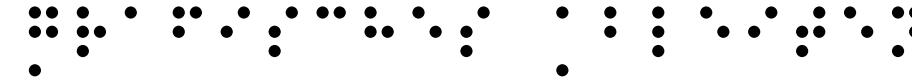
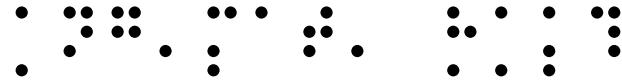
$f'''(x) = e^x$

eulersche Zahl $e=2,71828...$

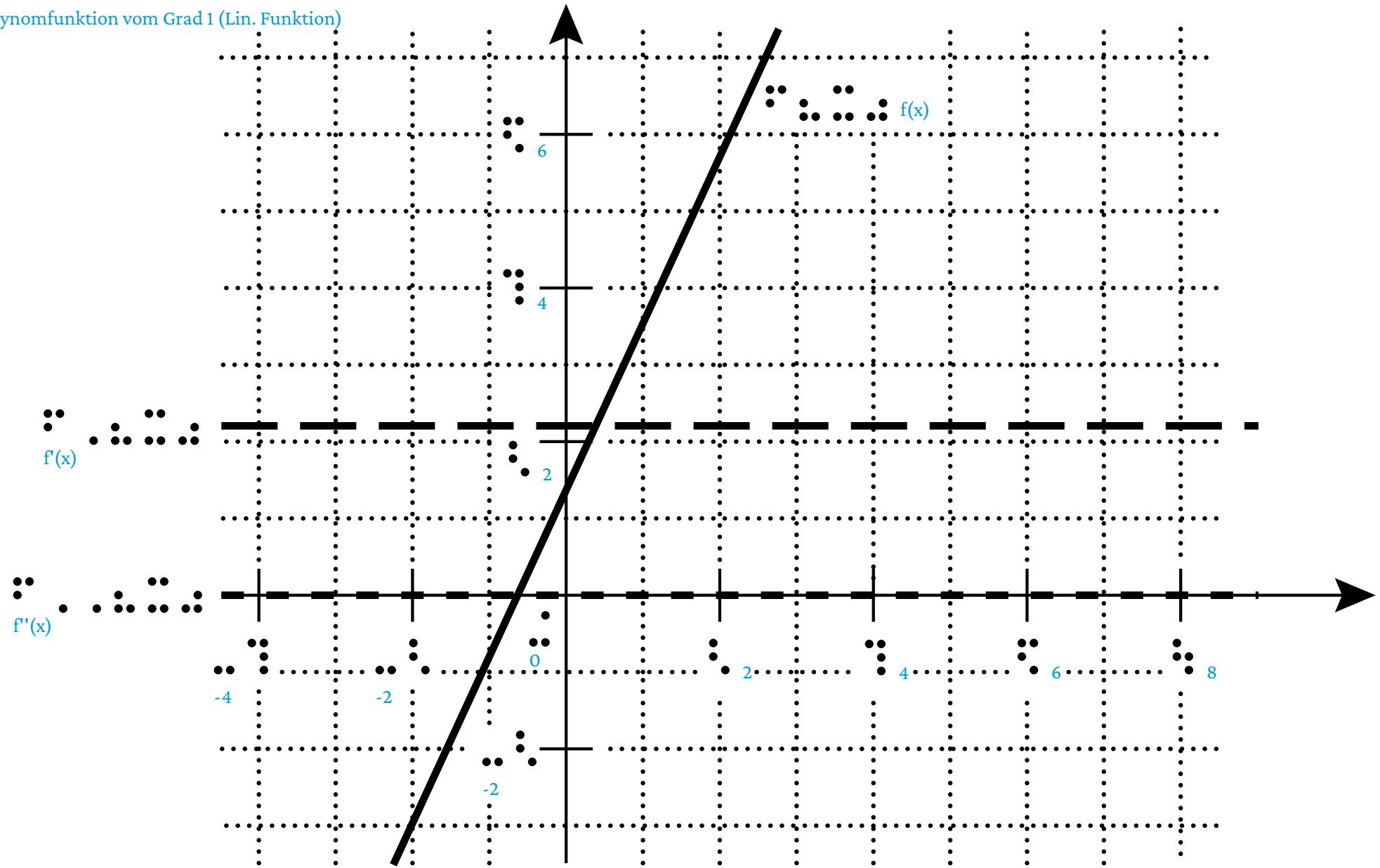
$f(x) = e^x$

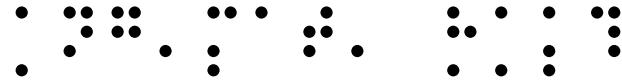
$f'(x) = e^x$



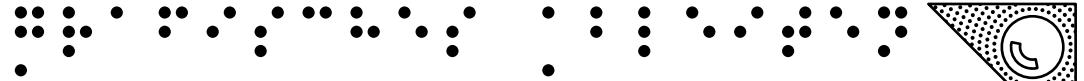


Polynomfunktion vom Grad 1 (Lin. Funktion)

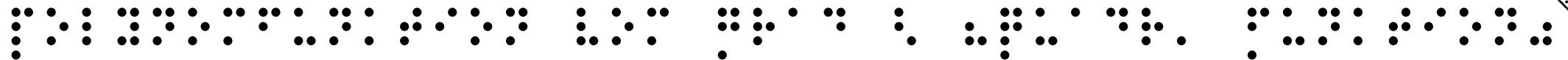




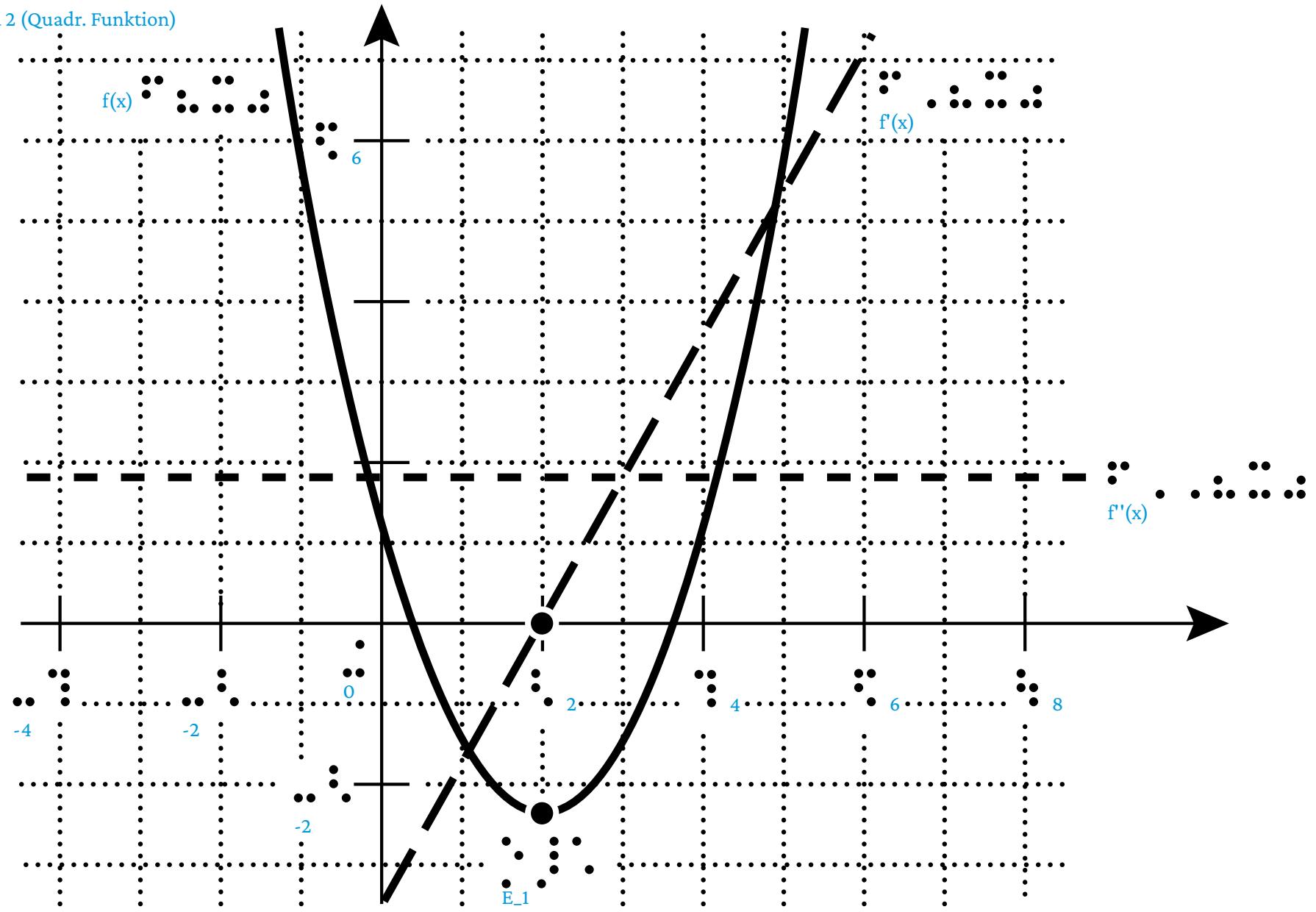
Ang. Mat. HAK4

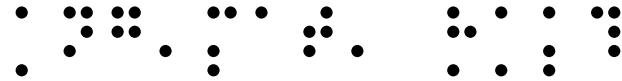


Grafisches Ableiten



Polynomfunktion vom Grad 2 (Quadr. Funktion)

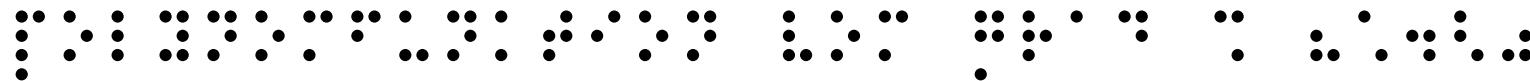
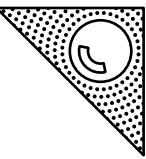




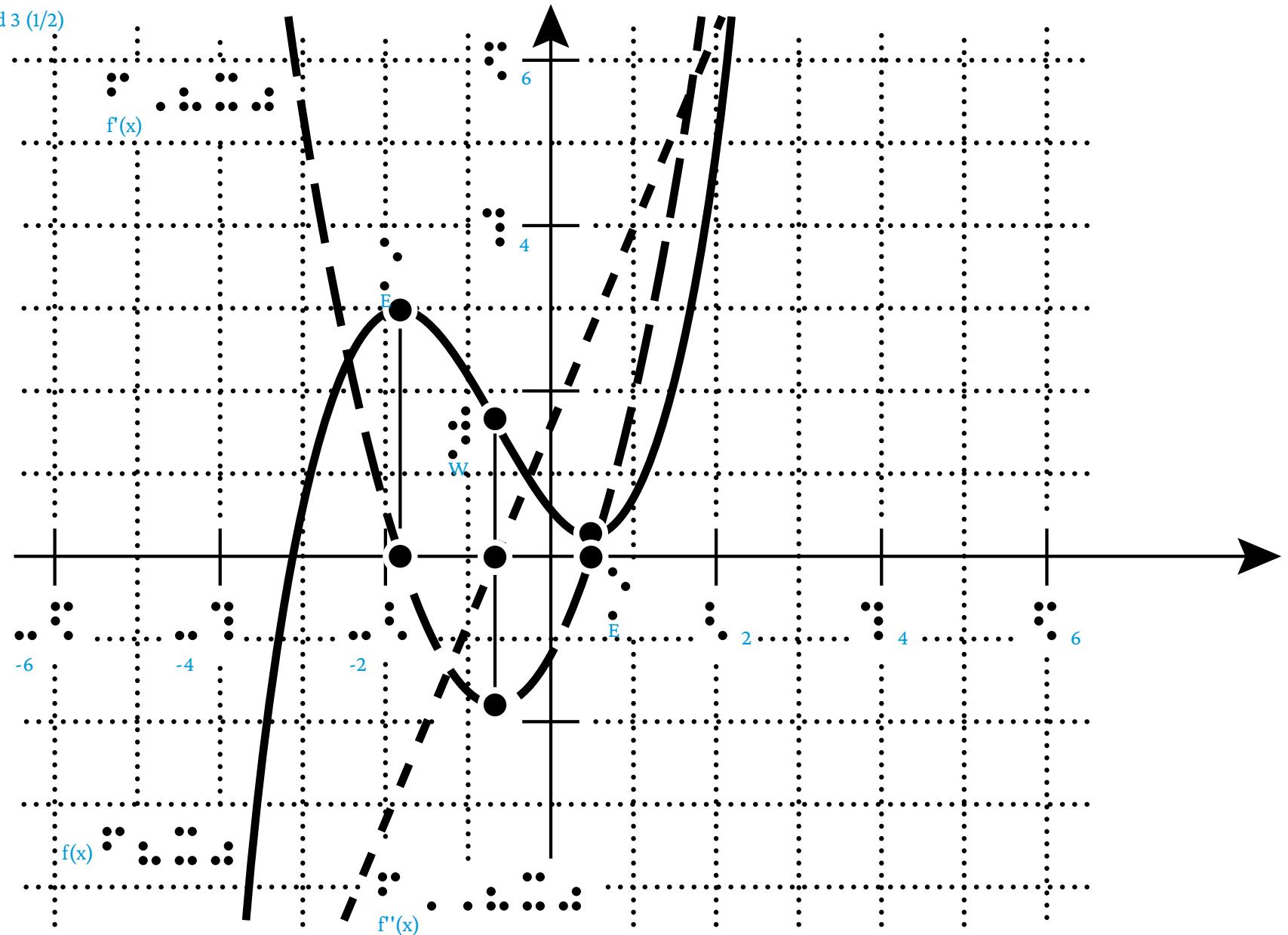
Ang. Mat. HAK4

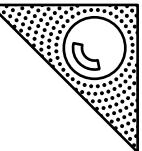


Grafisches Ableiten

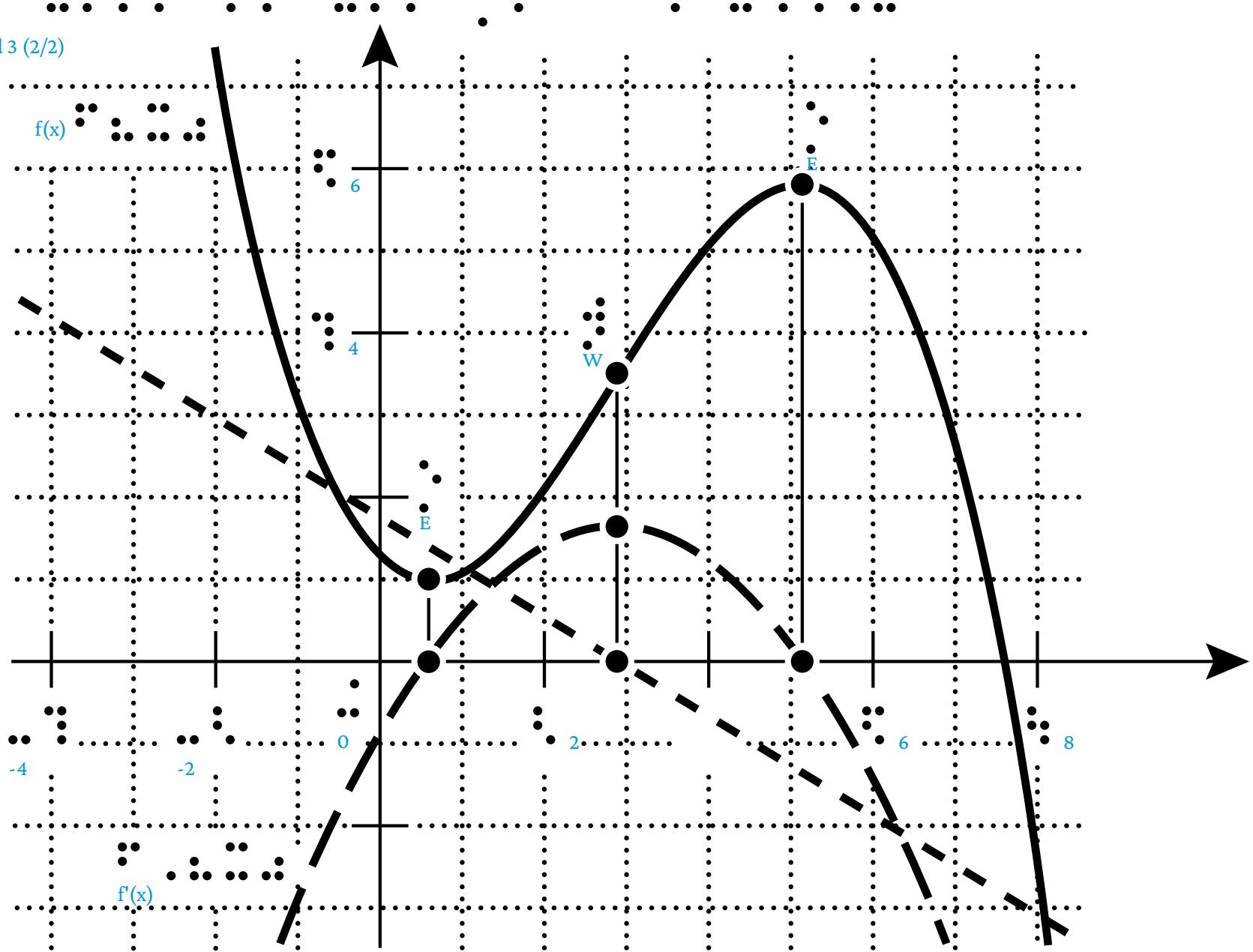


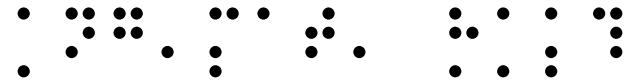
Polynomfunktion vom Grad 3 (1/2)



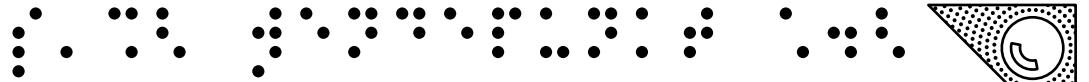


Polynomfunktion vom Grad 3 (2/2)

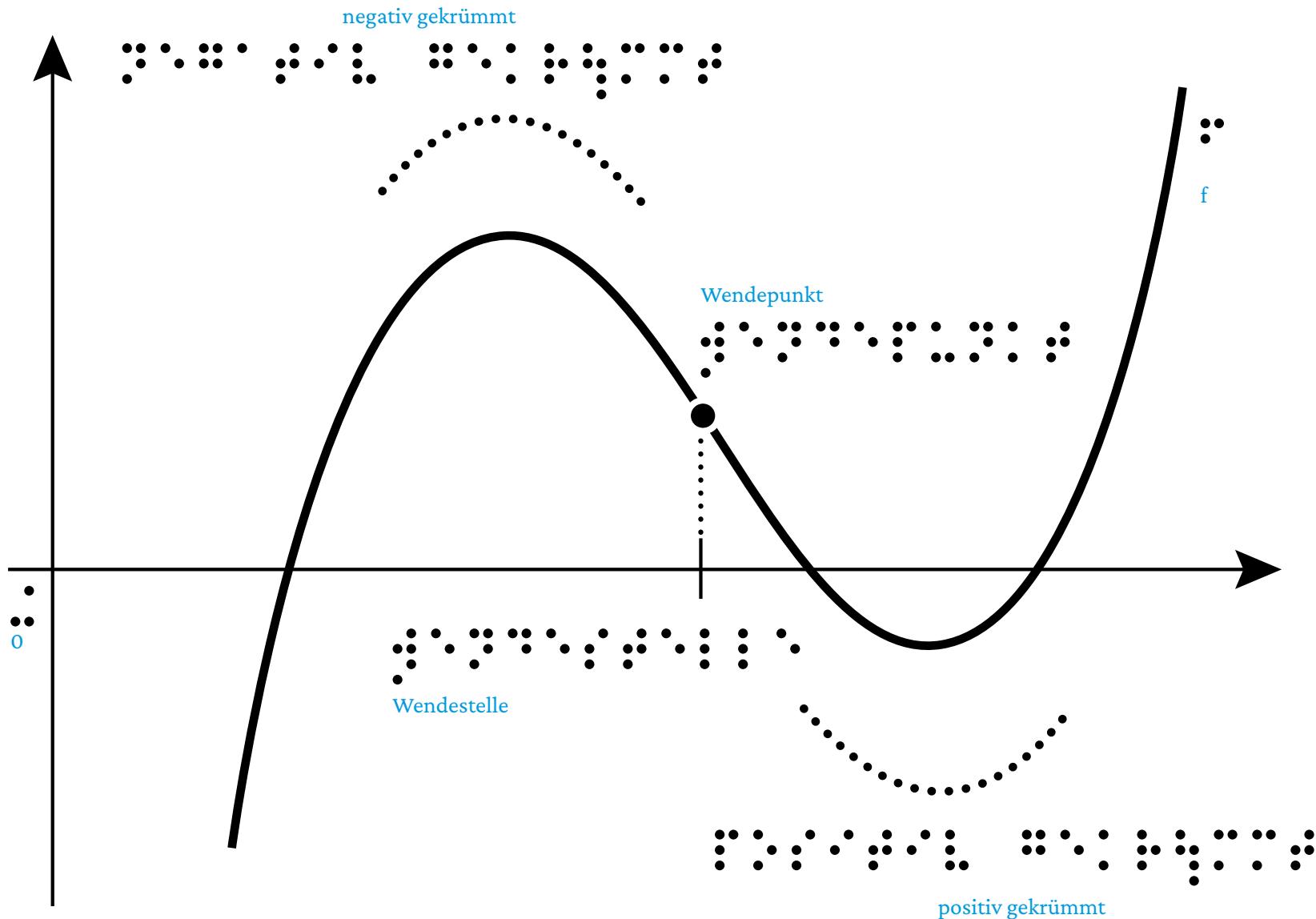
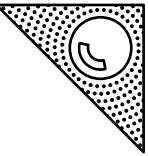


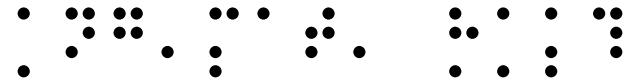


Ang. Mat. HAK4



S.32 Wendepunkt 1/2

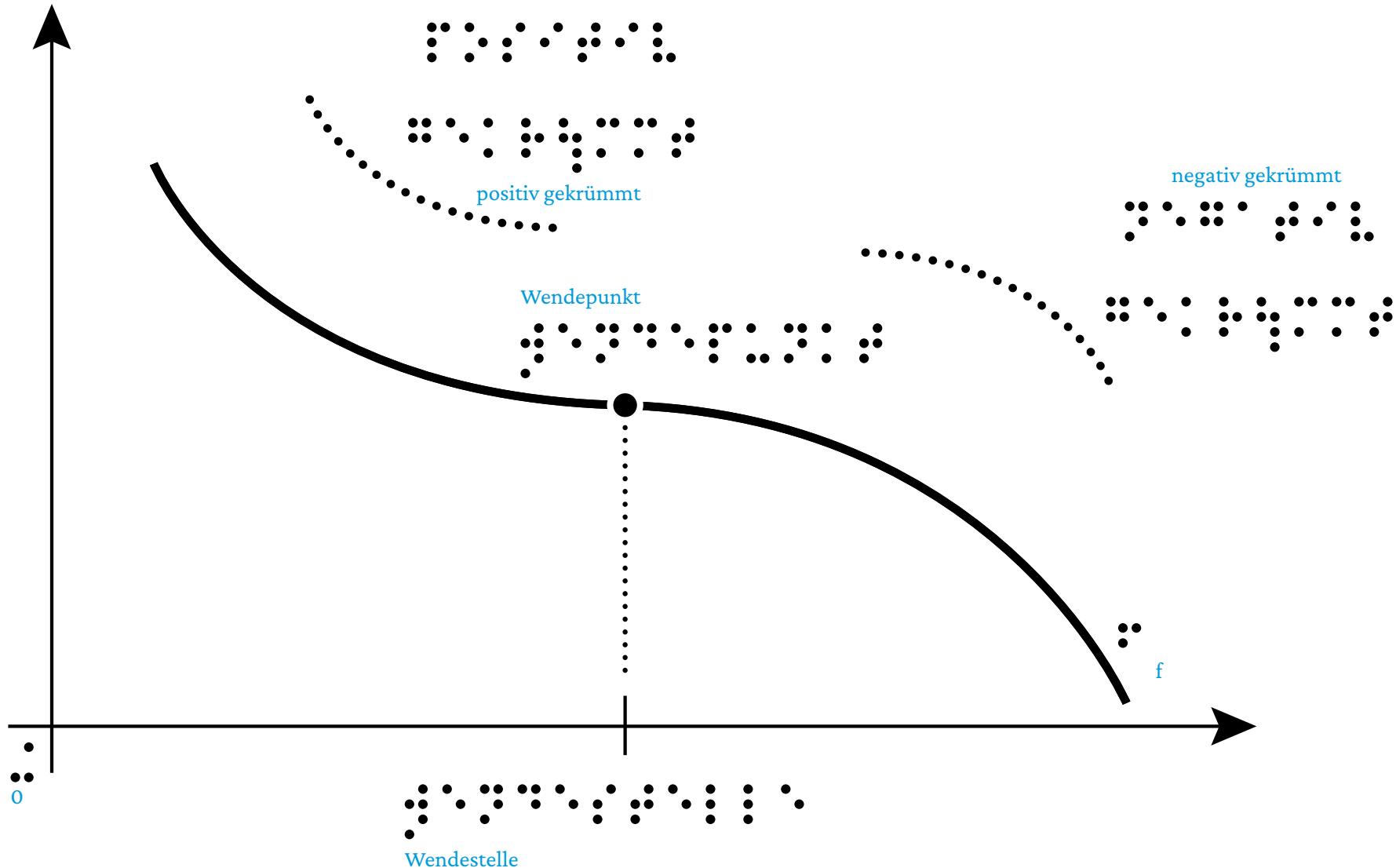
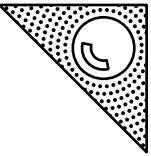




Ang. Mat. HAK4

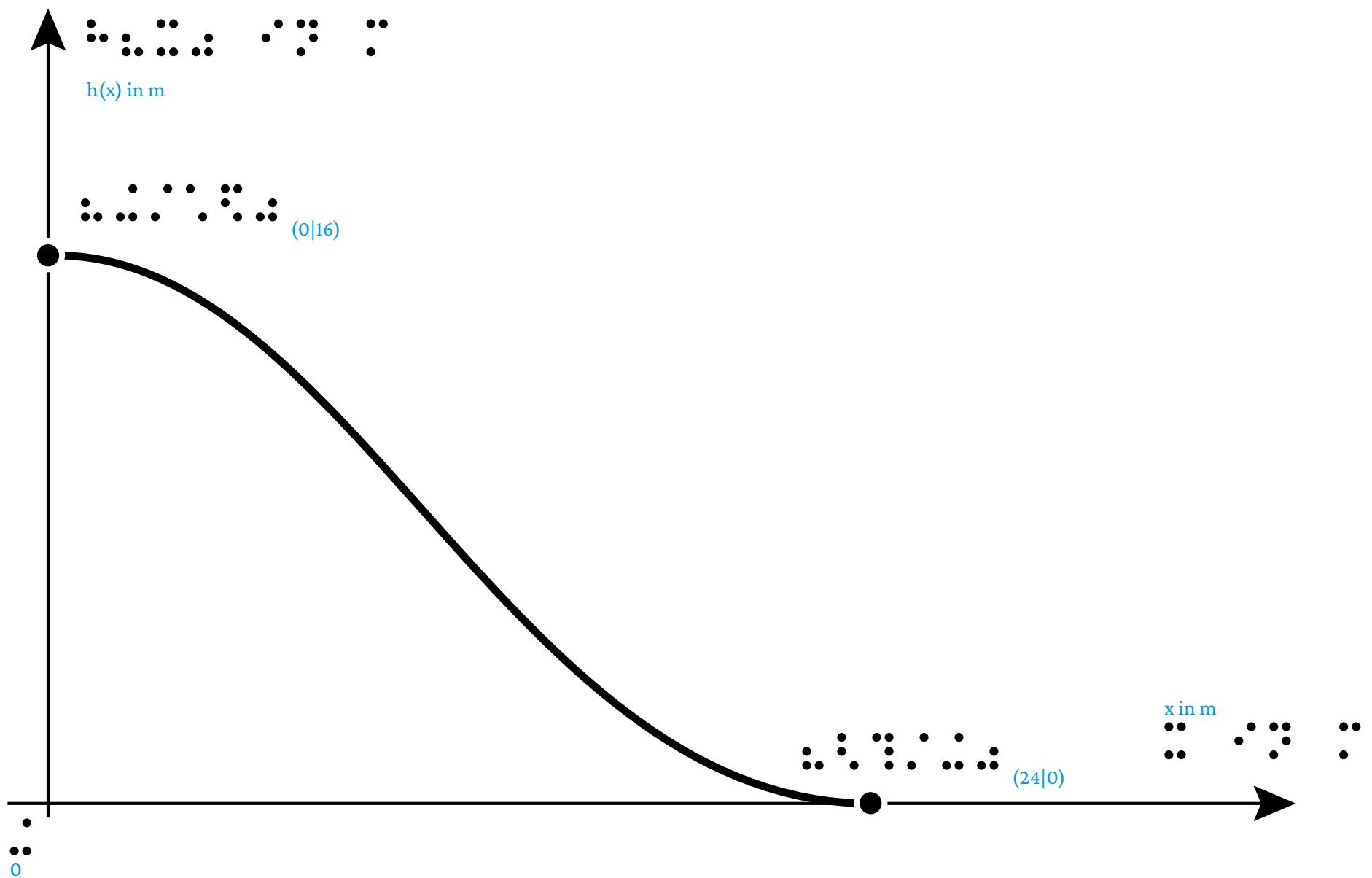


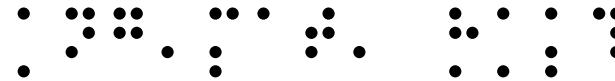
S.32 Wendepunkt 2/2



Ang.Mat. HAK4

S.46 2.85

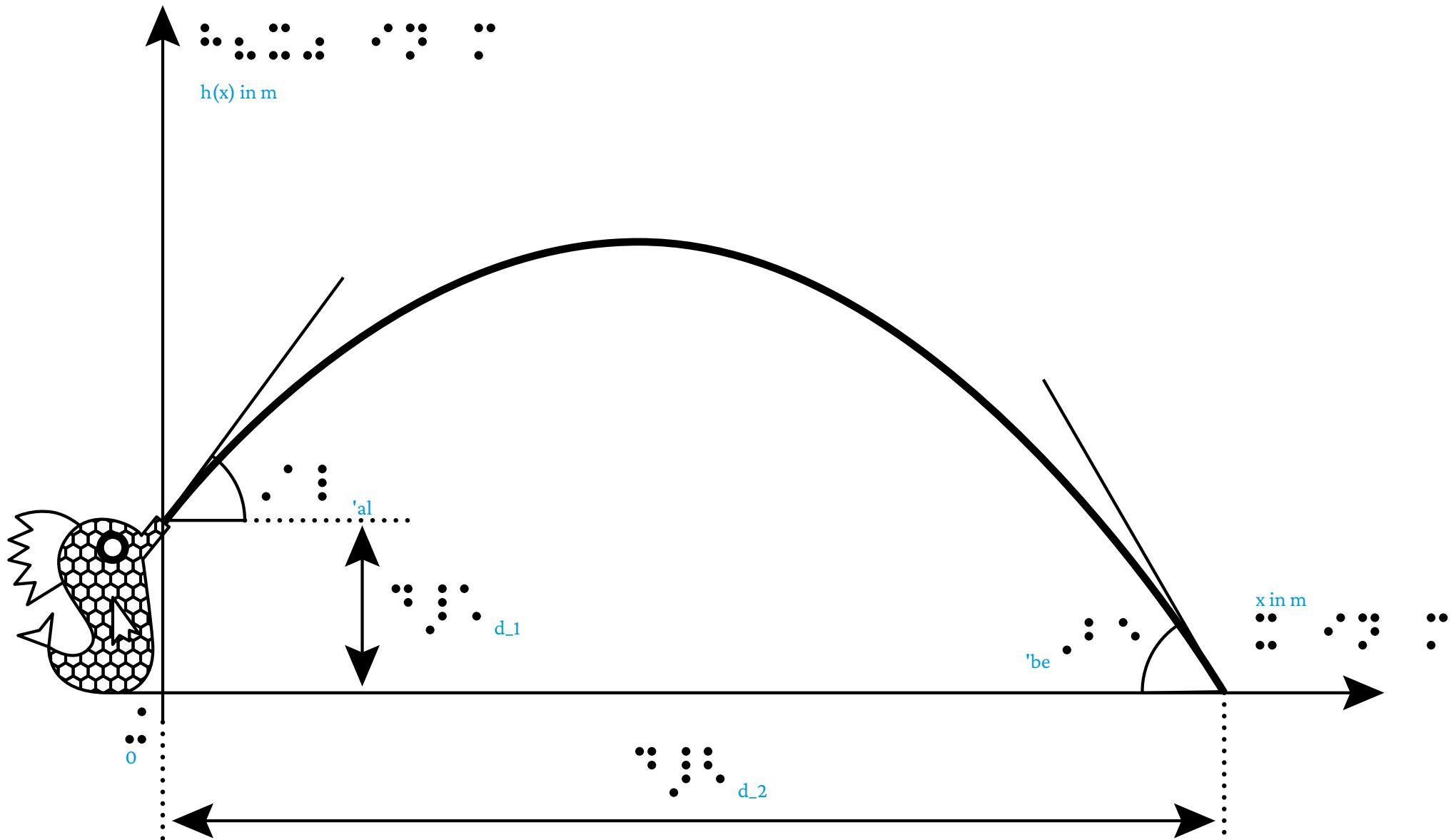


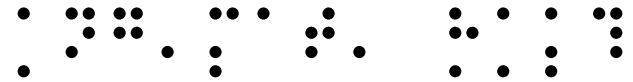


Ang.Mat. HAK4



S.46 2.86

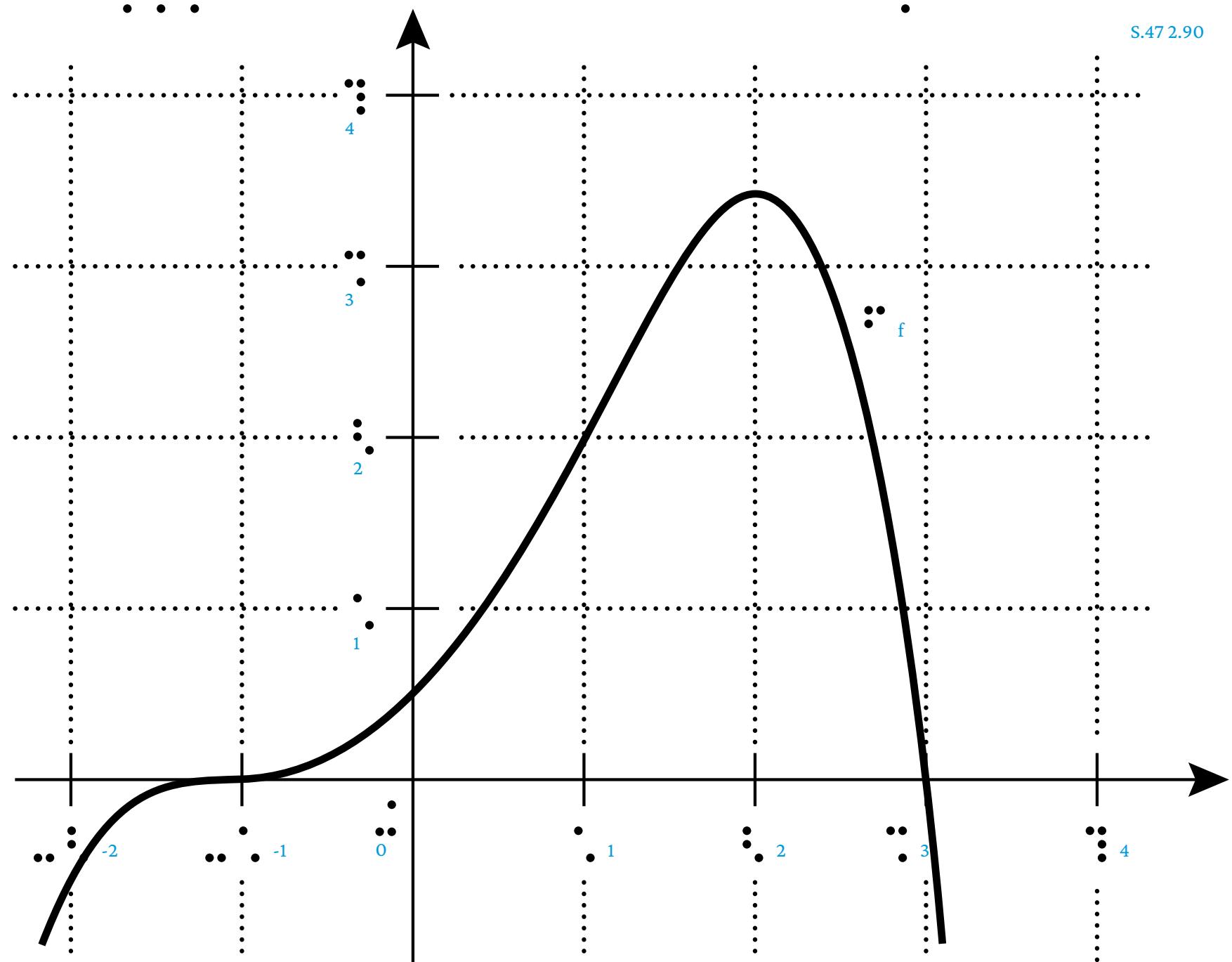
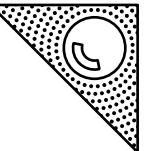


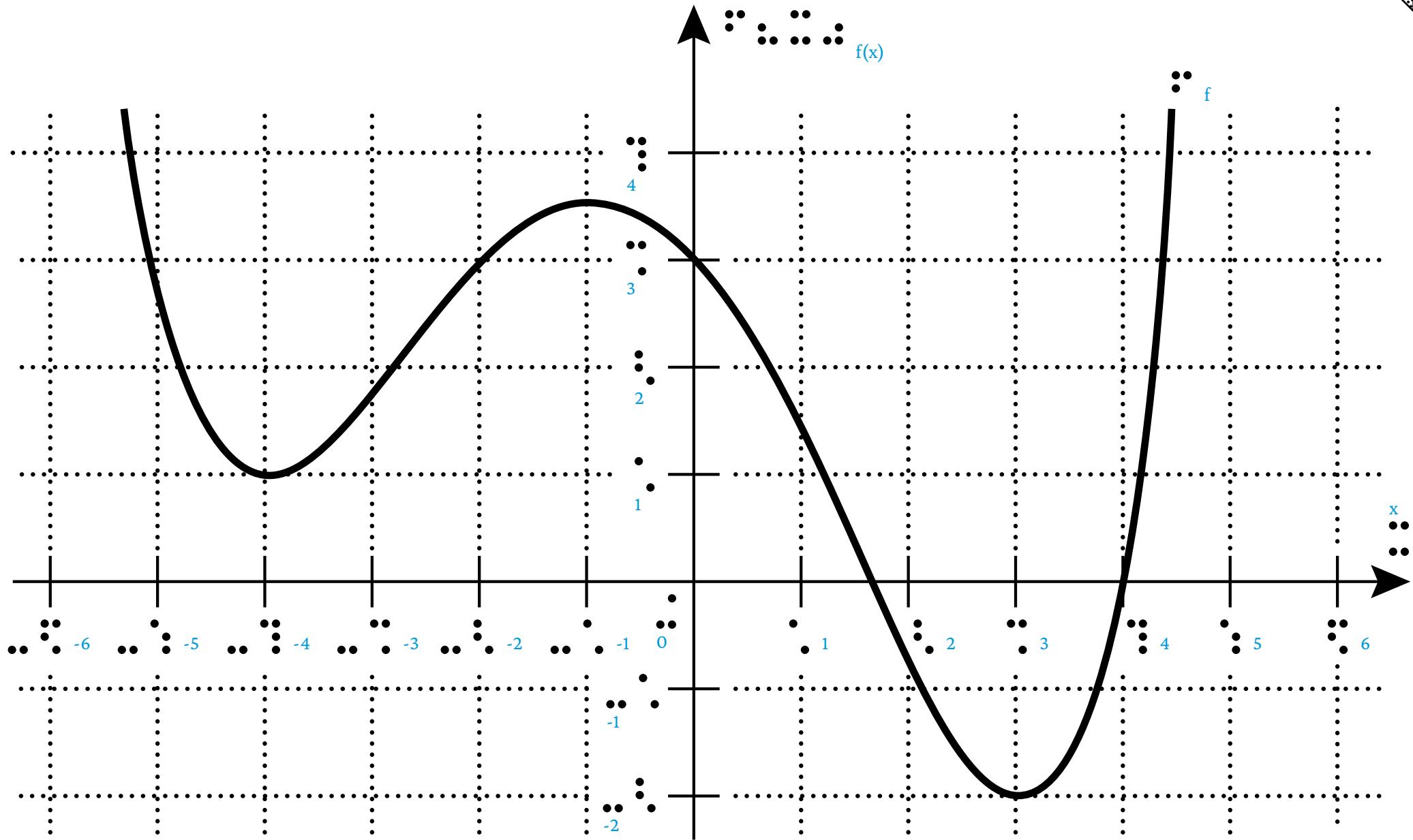
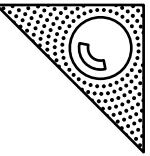
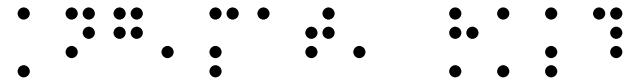


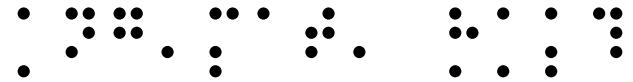
Ang. Mat. HAK4



S.47 2.90



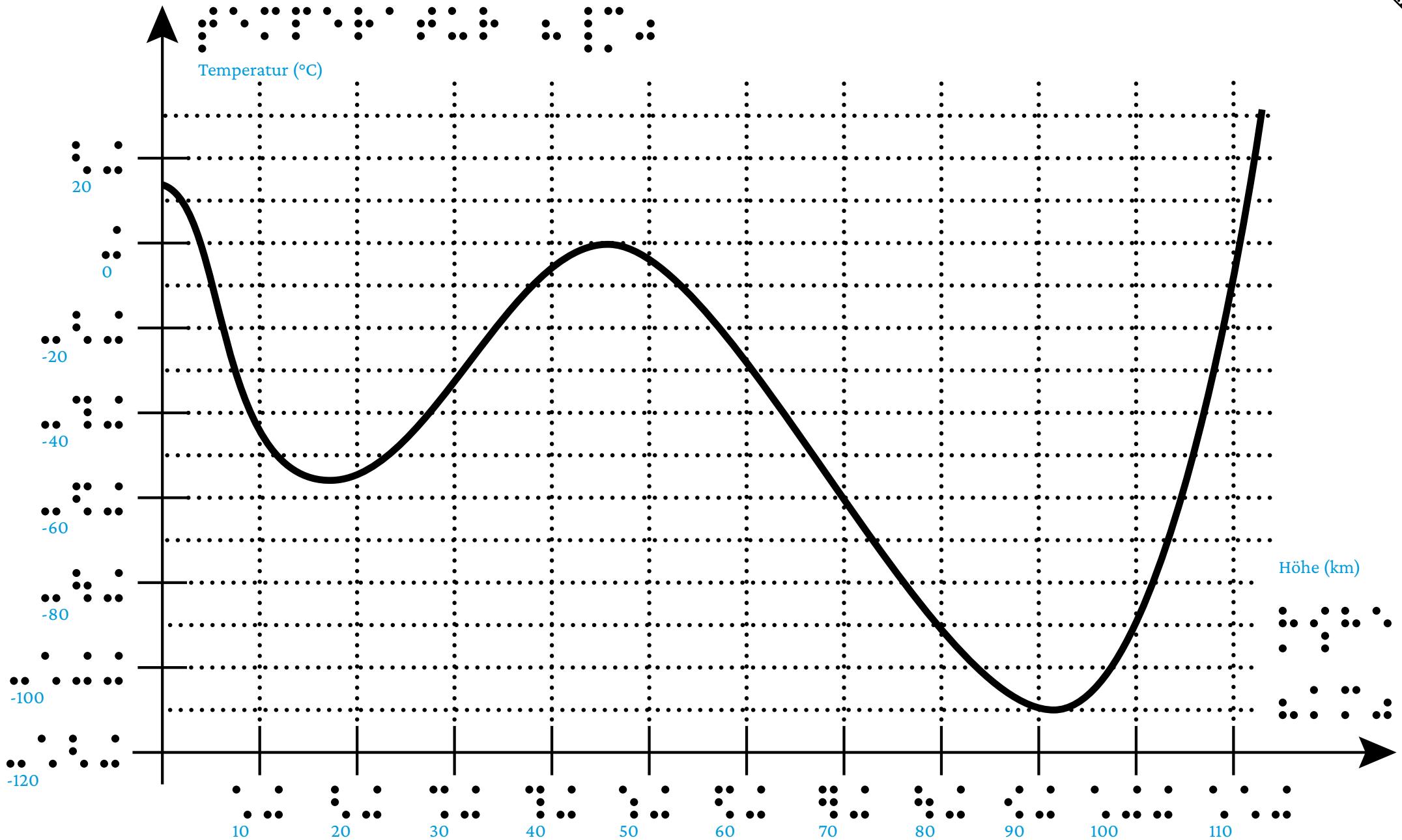


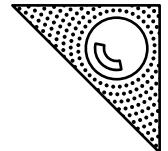


Ang. Mat. HAK4



S.50 2.95





Ang. Mat. HAK4

Ang. Mat. HAK4

Ang. Mat. HAK4

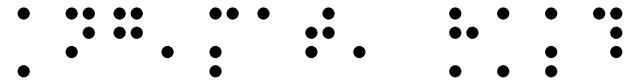
Ang. Mat. HAK4

3. Differentialrechnung - Vertiefung

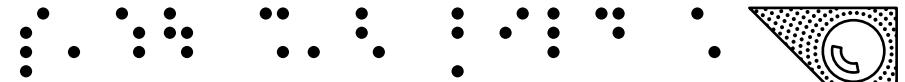
Angewandte Mathematik HAK Band 4

3.

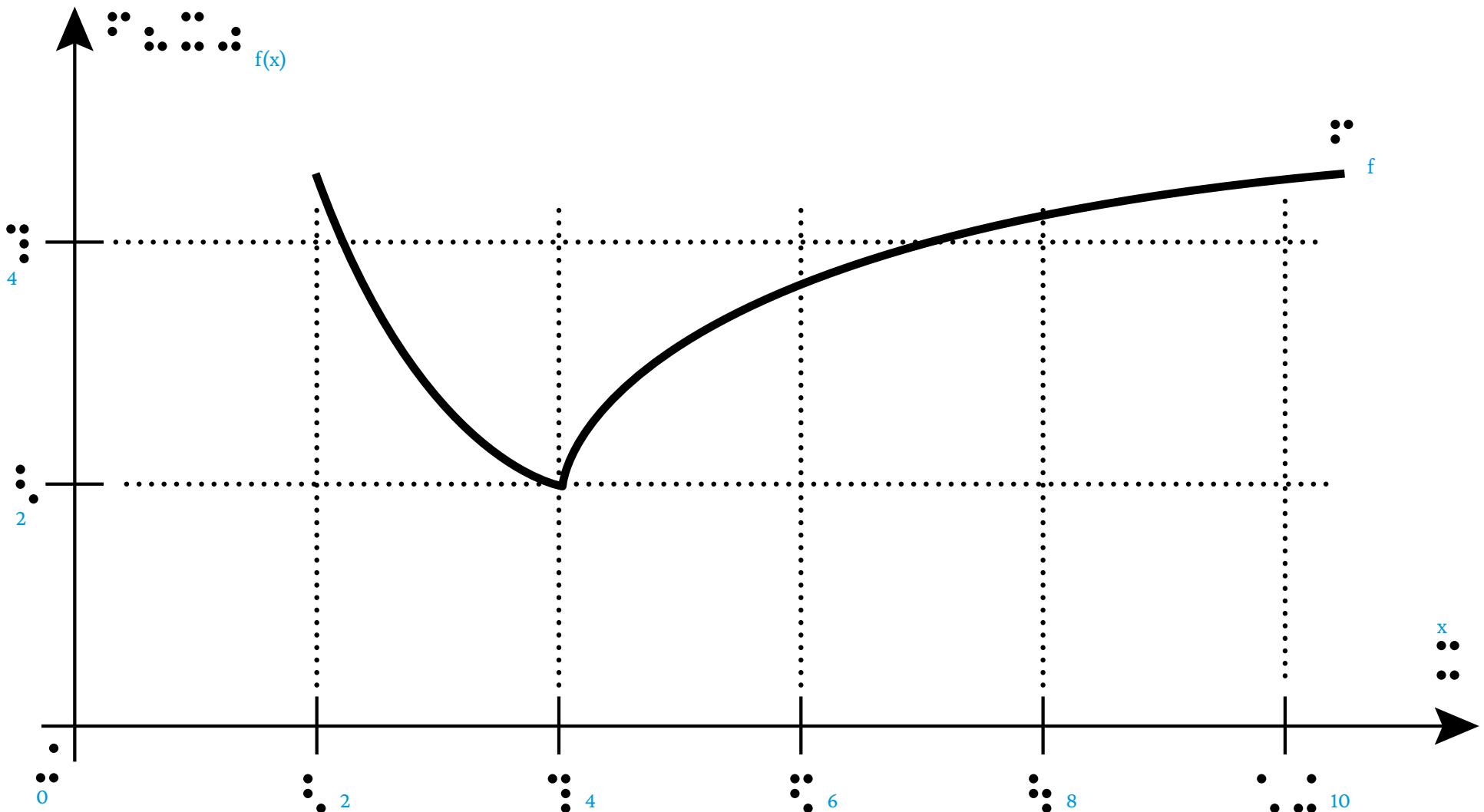
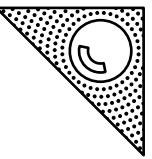
Differentialrechnung - Vertiefung

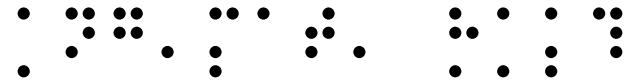


Ang. Mat. HAK4

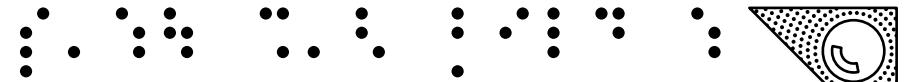


S.58 3.2 Bild 1

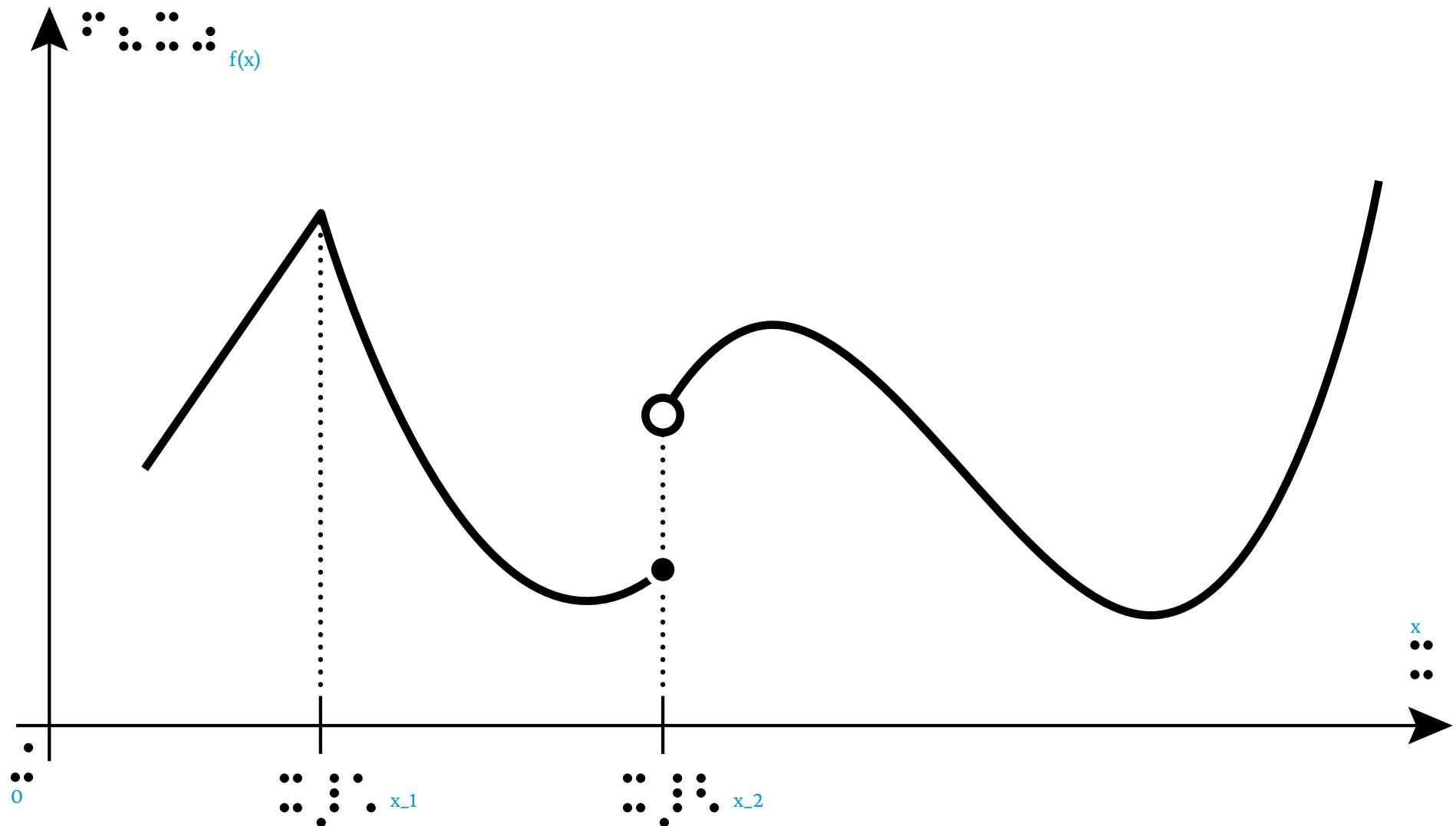
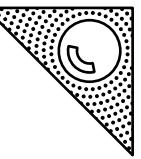


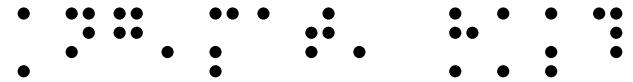


Ang. Mat. HAK4

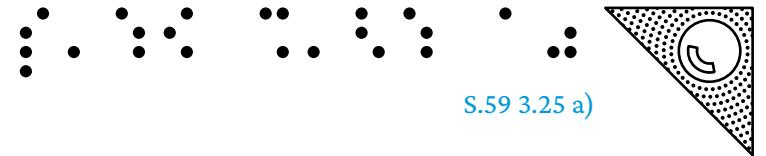


S.58 3.2 Bild 5

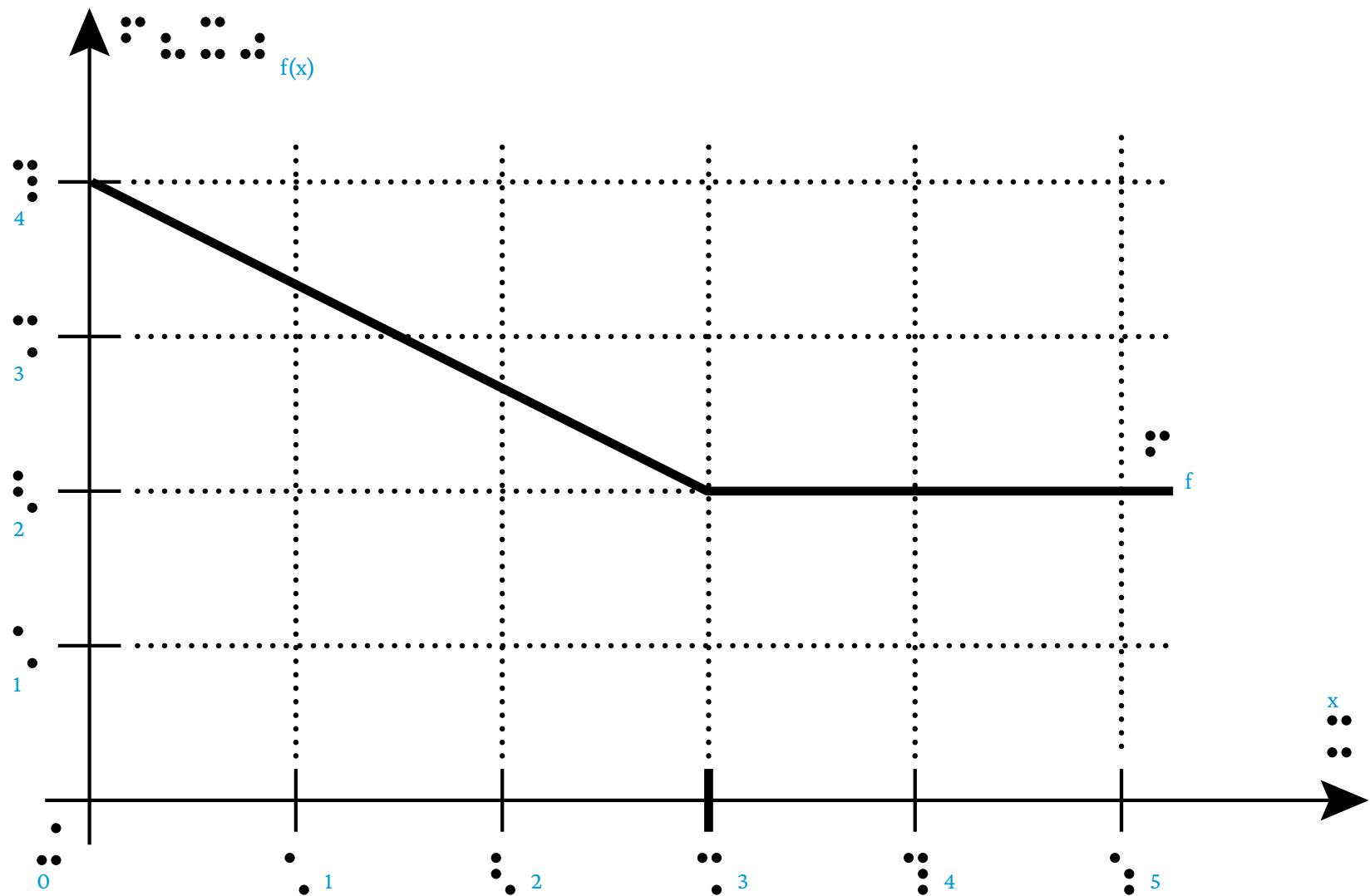


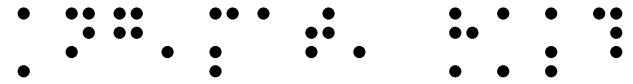


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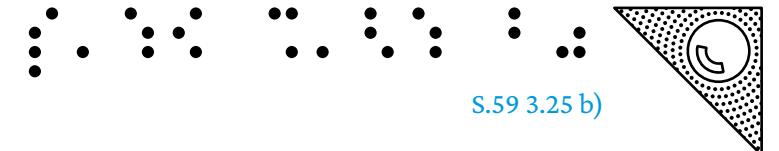


S.59 3.25 a)

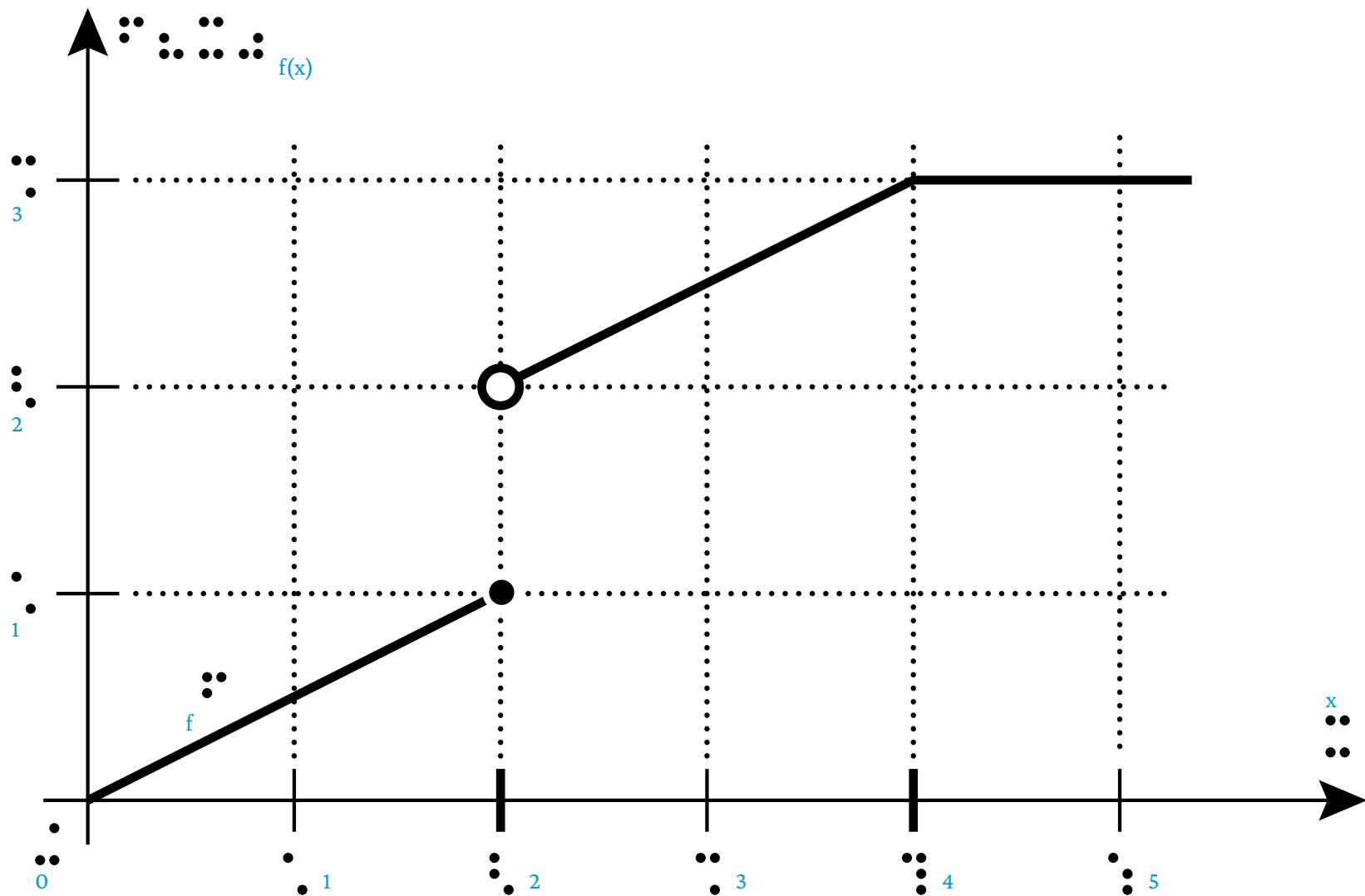


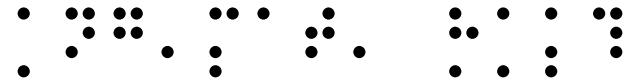


Ang. Mat. HAK4

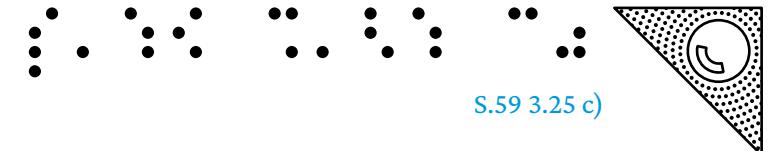


S.59 3.25 b)

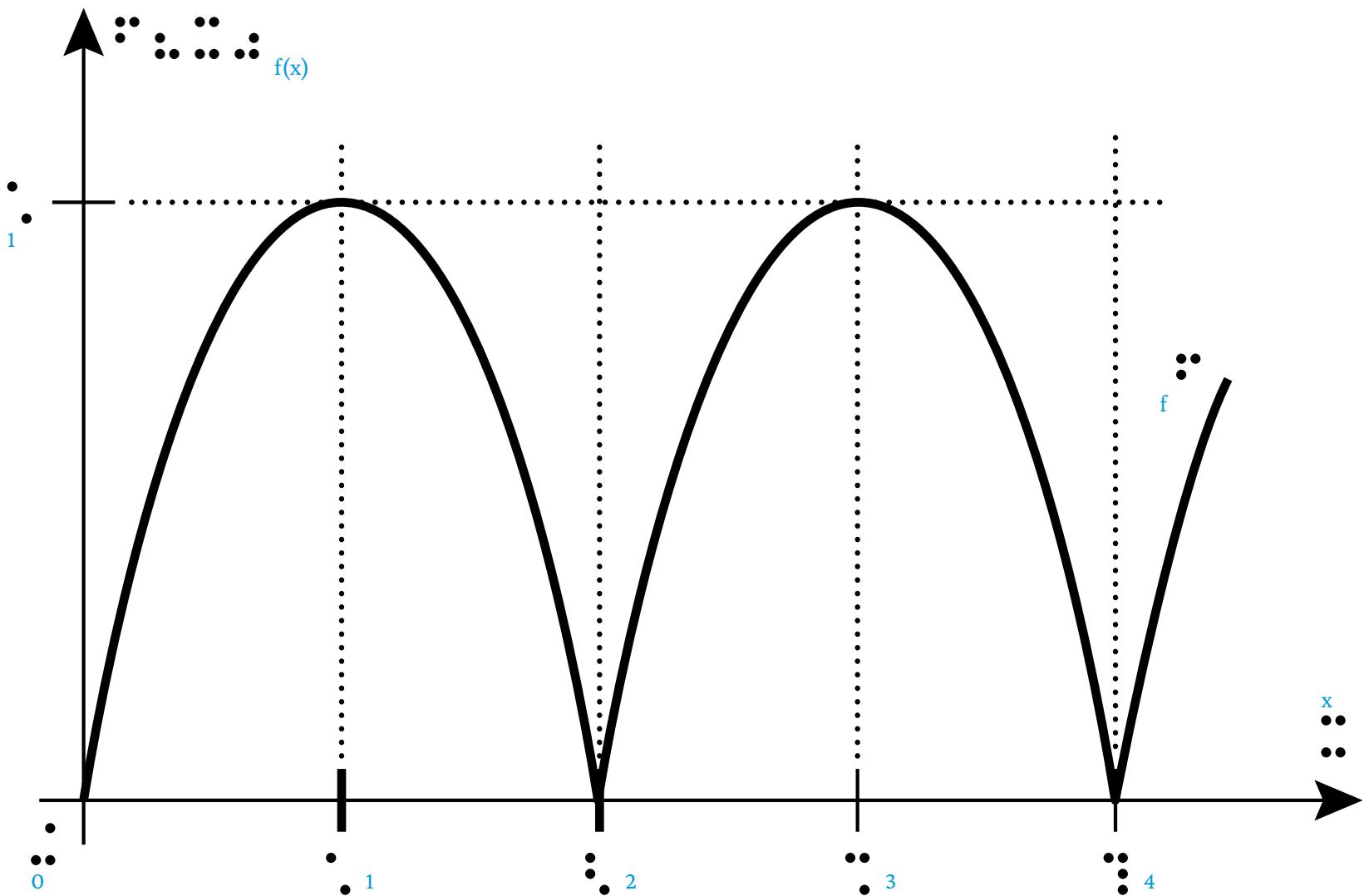
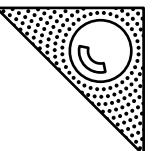


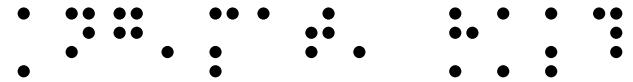


Ang. Mat. HAK4

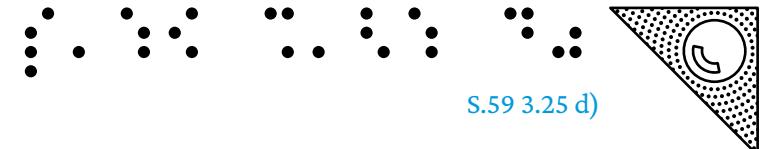


S.59 3.25 c)

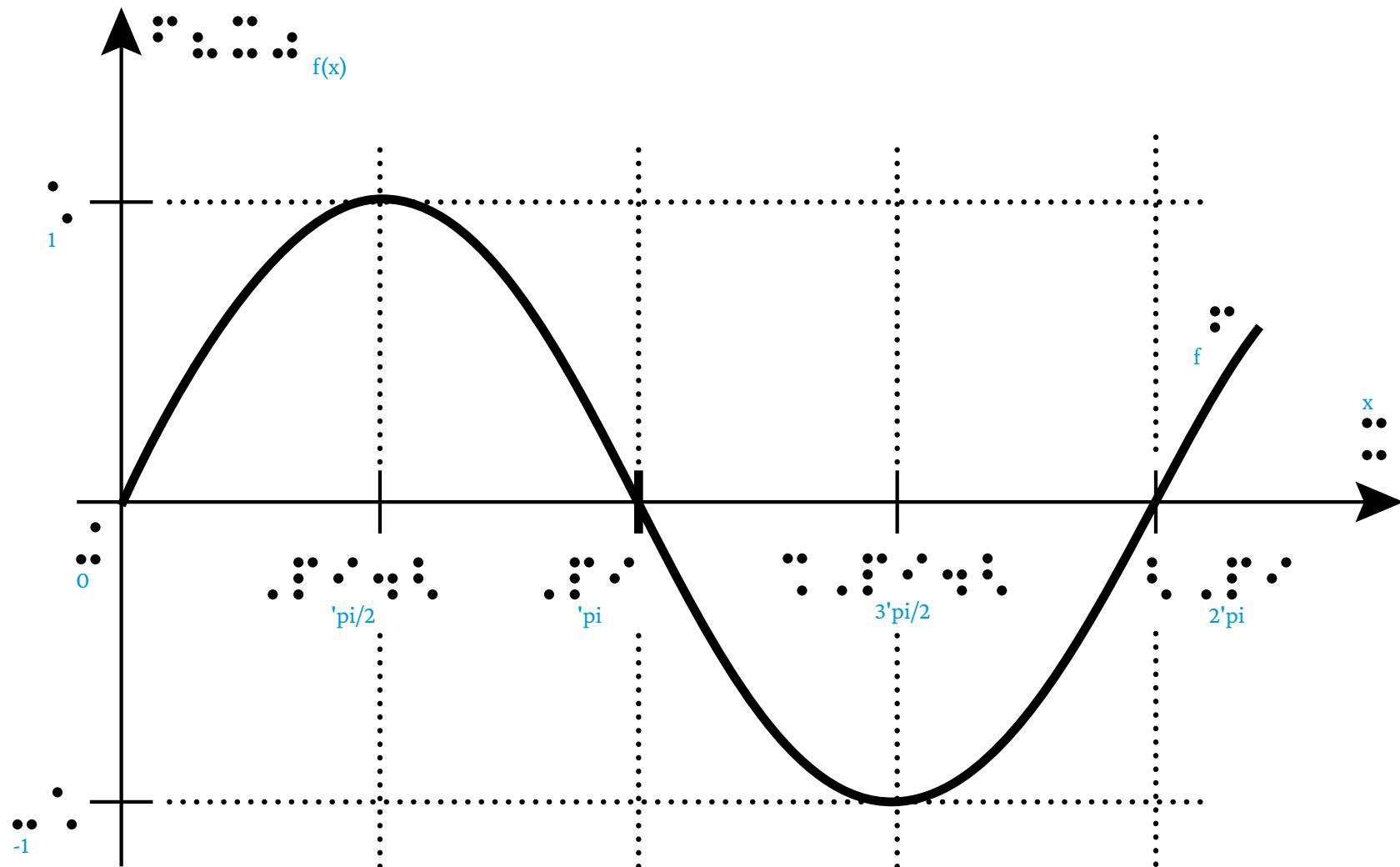


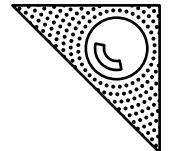


Ang. Mat. HAK4



S.59 3.25 d)





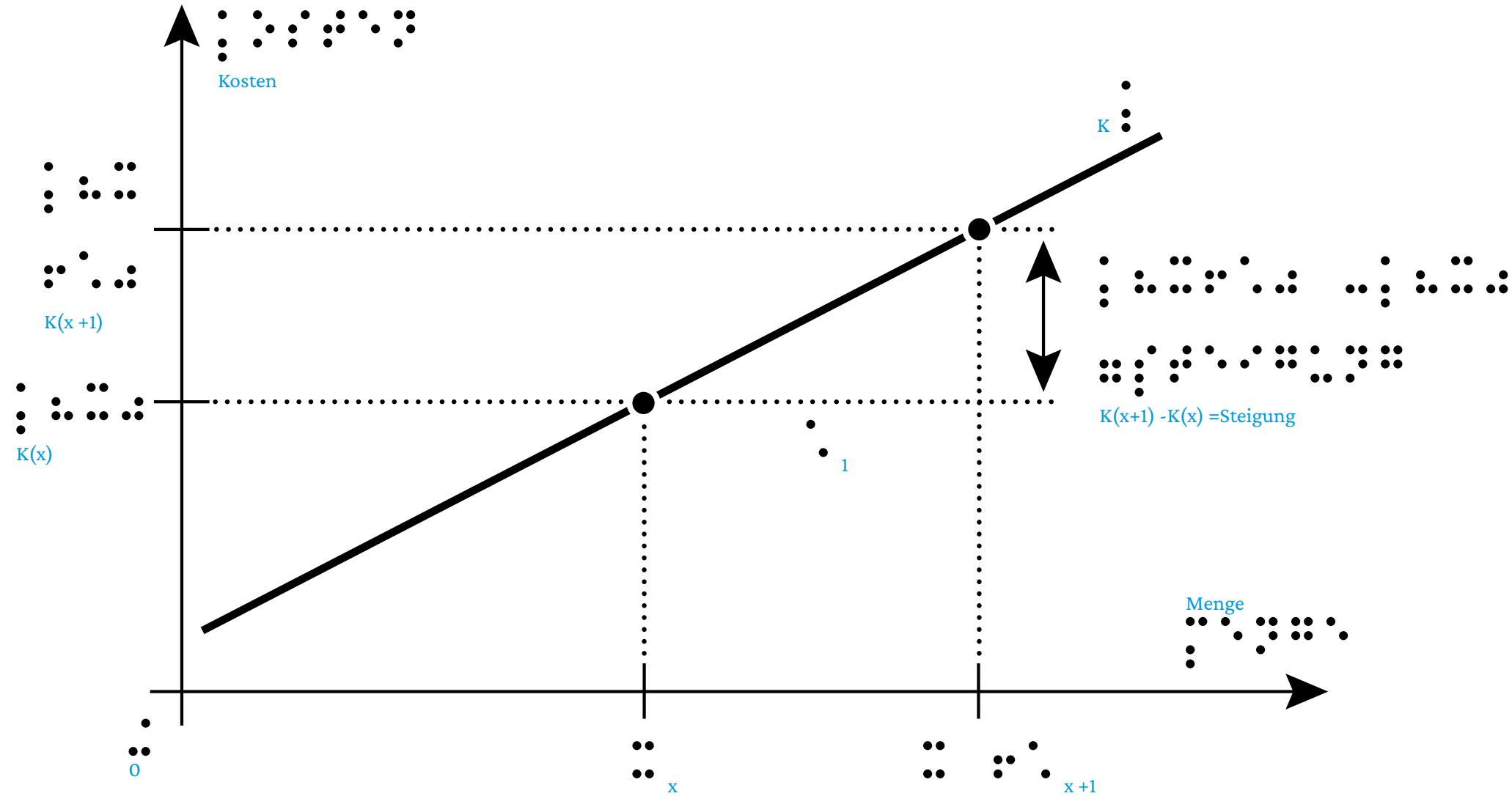
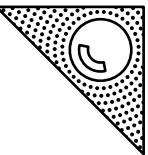
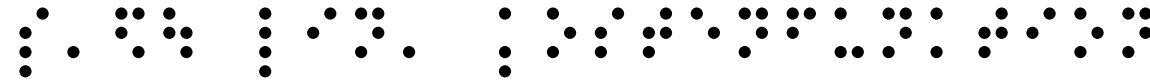
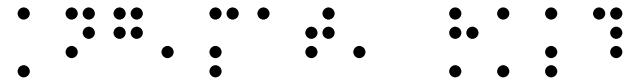
Ang. Mat. HAK4

4. Kosten- und Preistheorie

Angewandte Mathematik HAK Band 4

4.

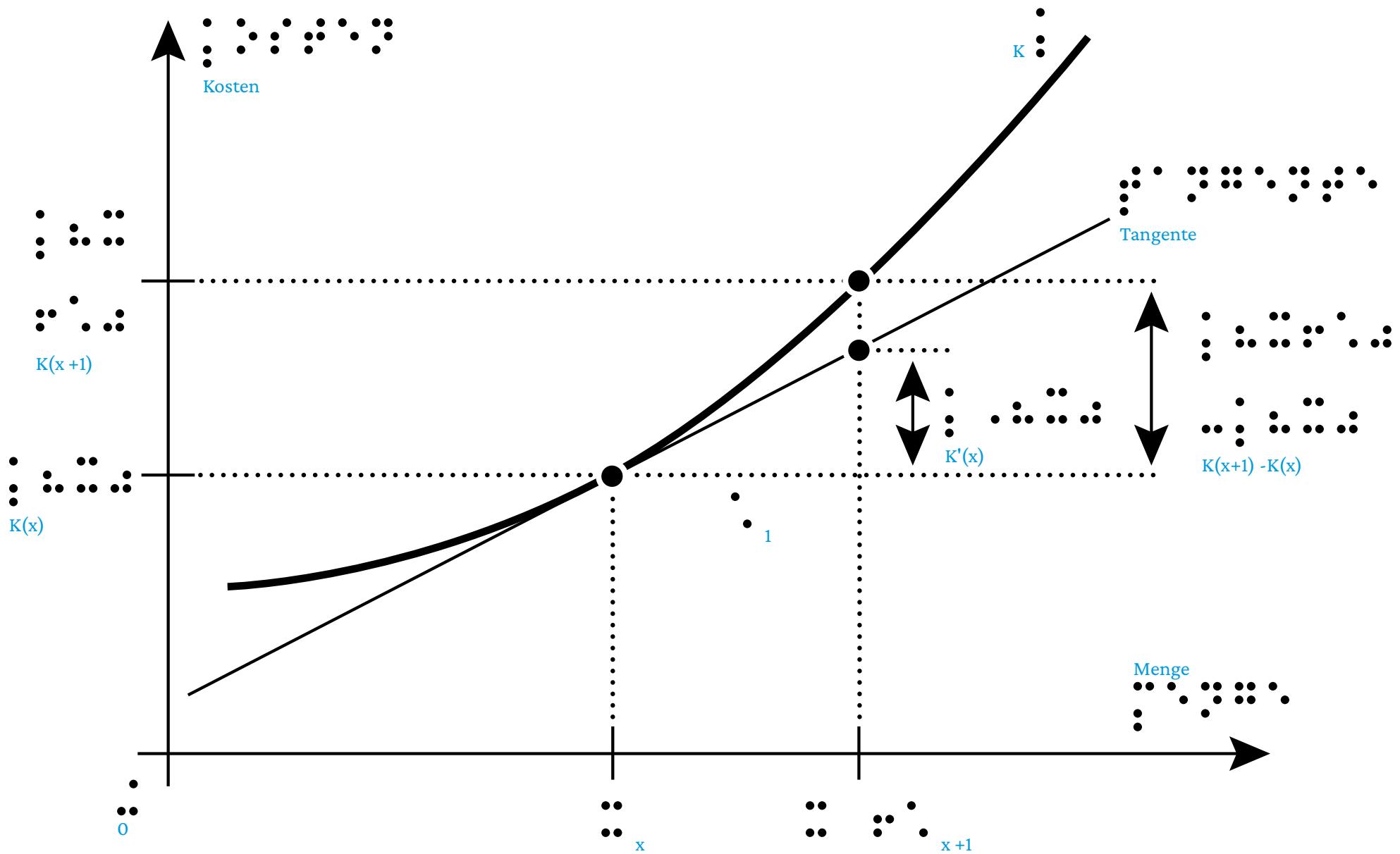
Kosten- und Preistheorie

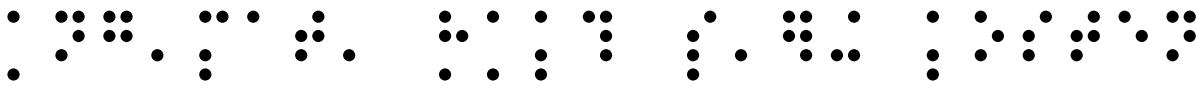




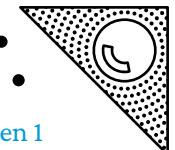
Ang. Mat. HAK4

S.68 Nichtlin. Kostenfunkt.

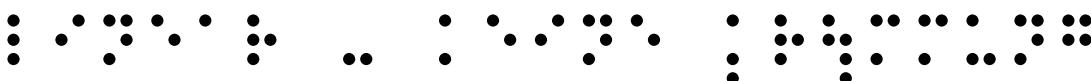




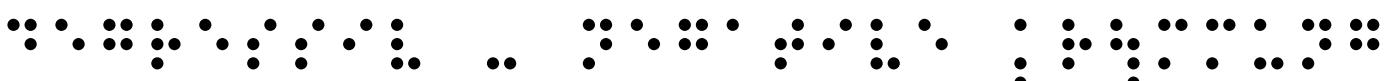
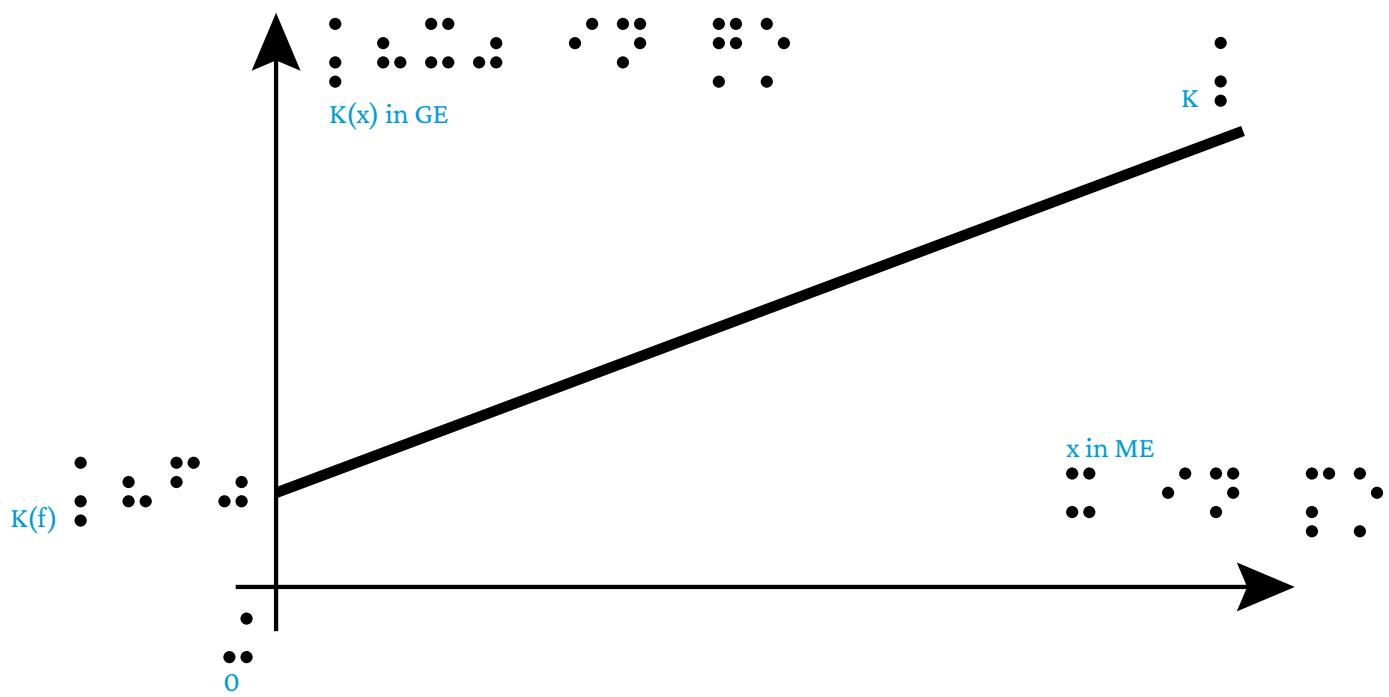
Ang. Mat. HAK4



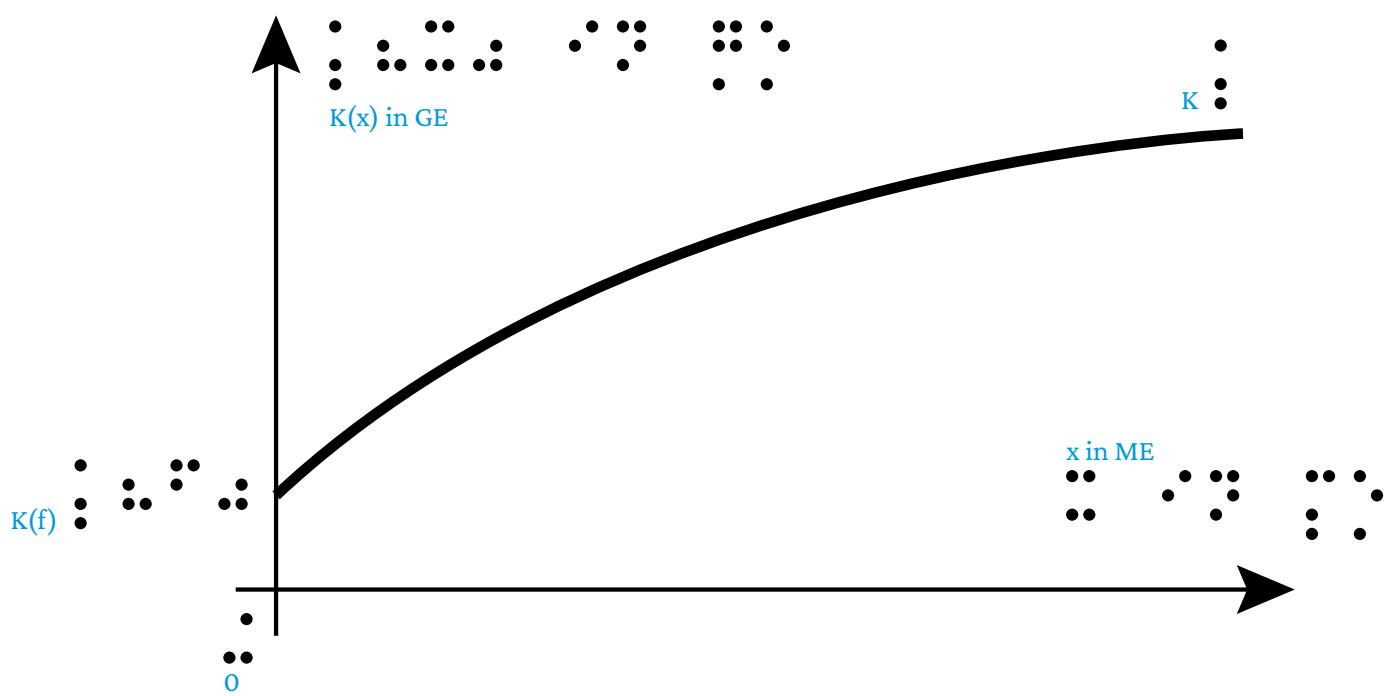
S.70 Kosten 1

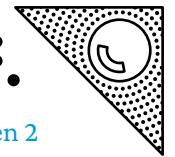


linear - keine Krümmung

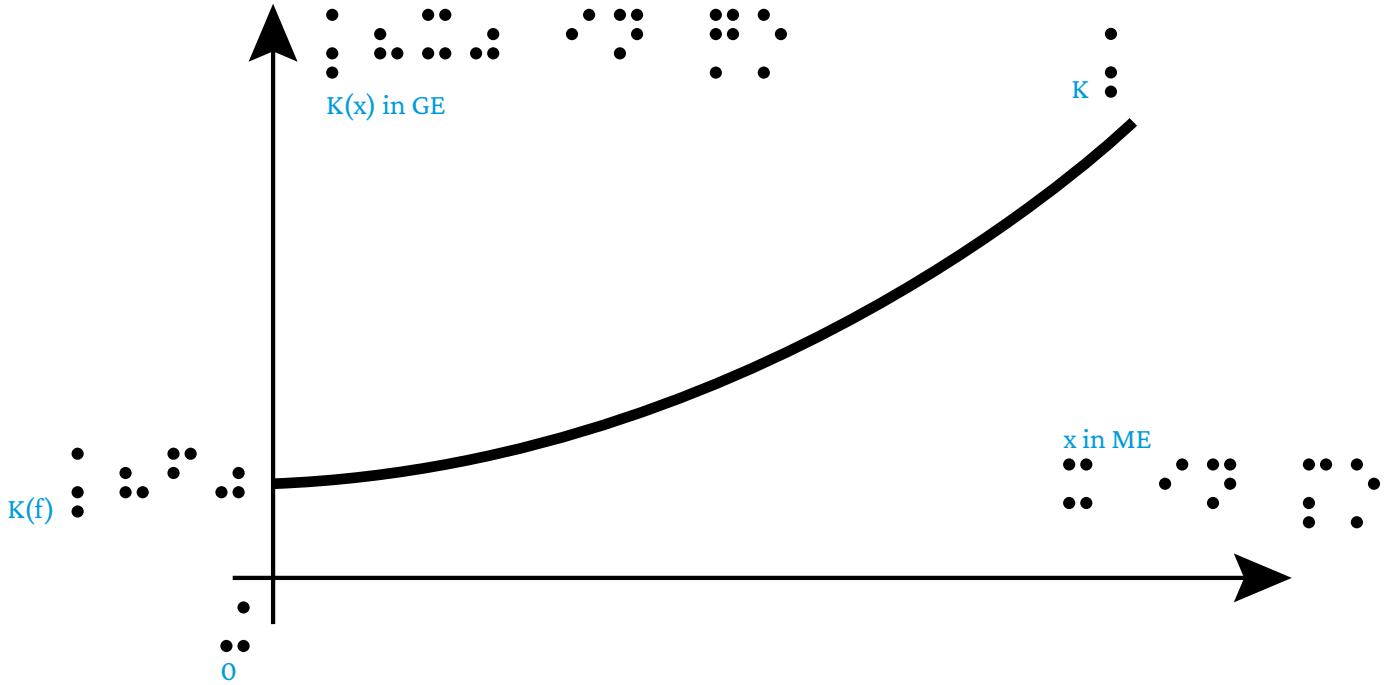


degressiv - negative Krümmung

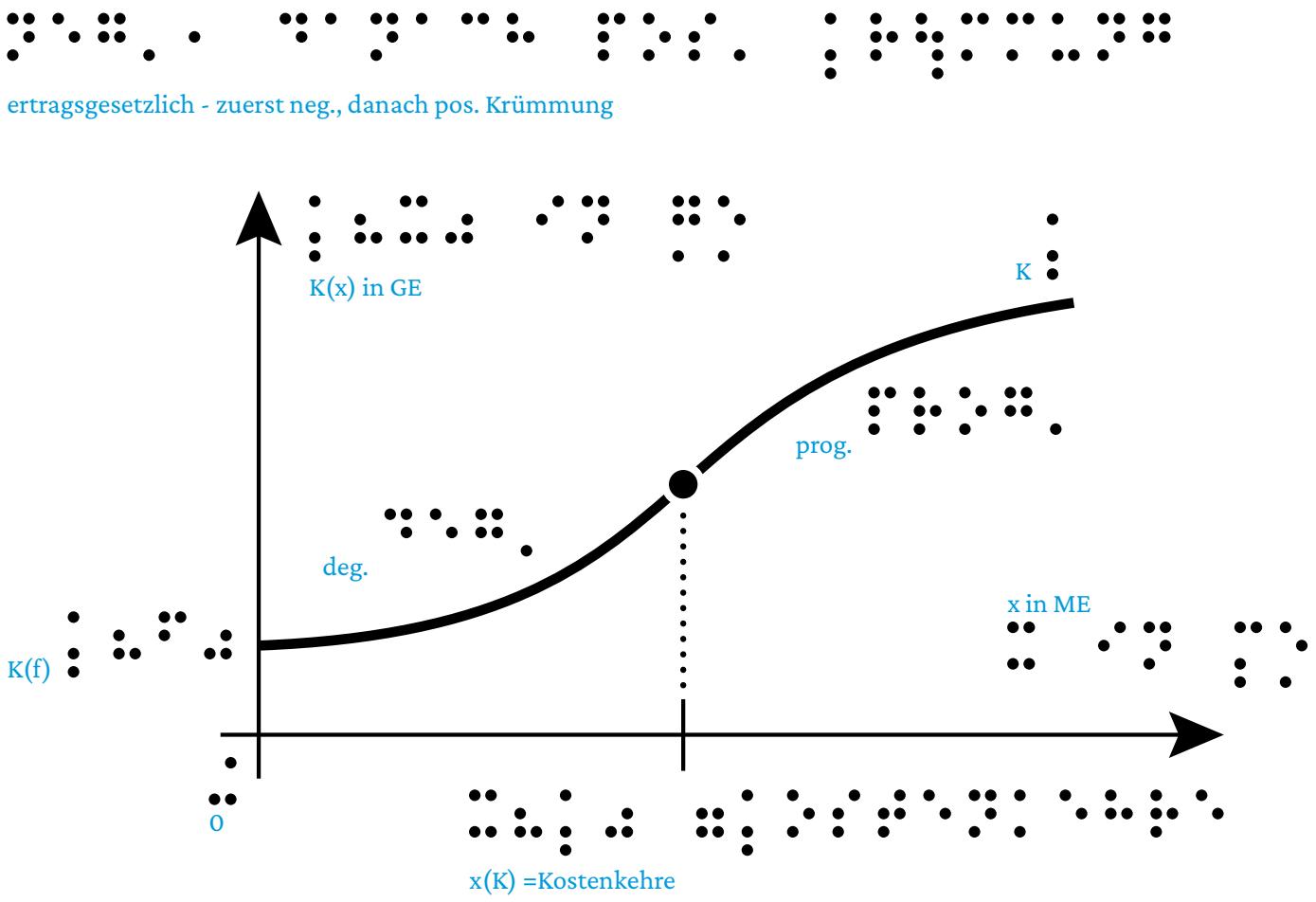


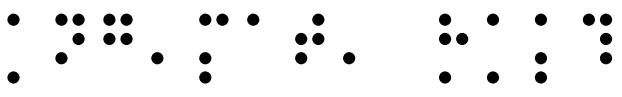


progressiv - positive Krümmung

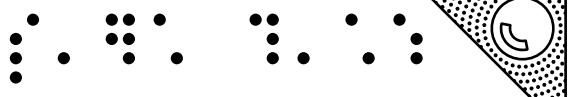


ertragsgesetzlich - zuerst neg., danach pos. Krümmung

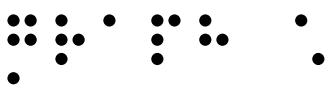




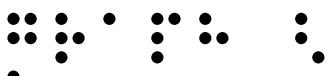
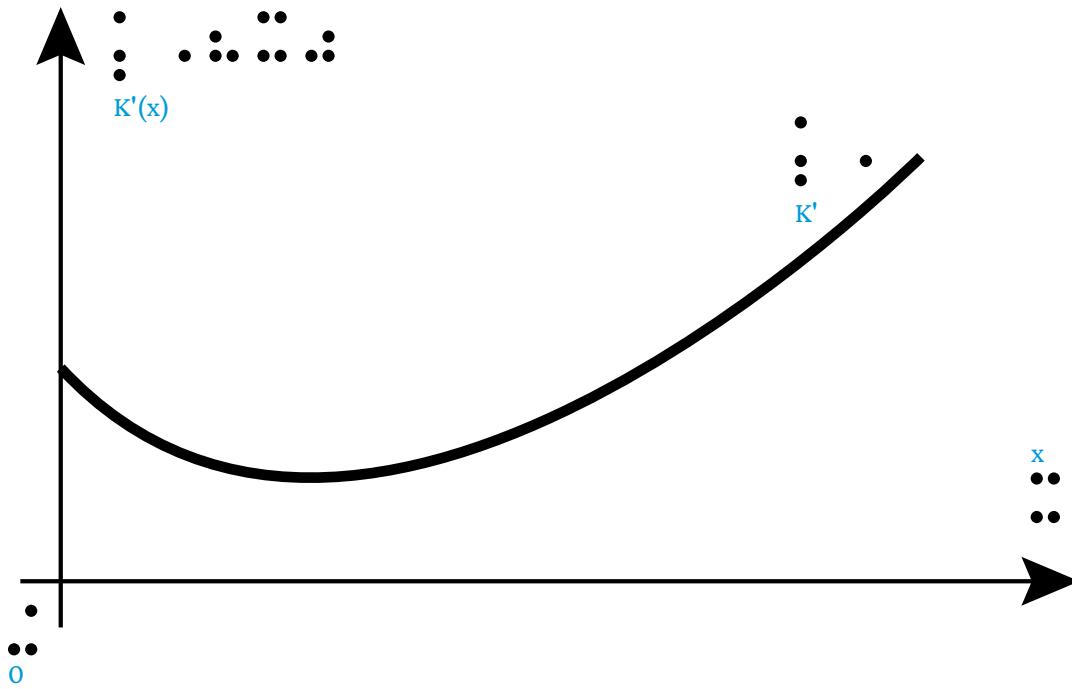
Ang. Mat. HAK4



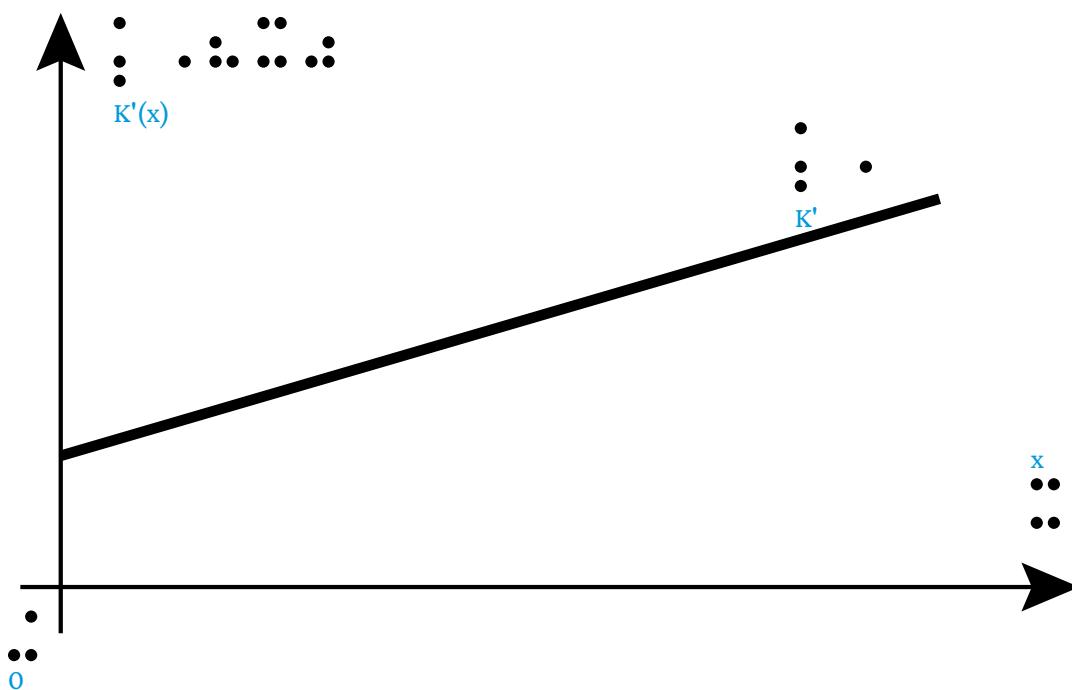
S.71 4.15



Graph 1



Graph 2

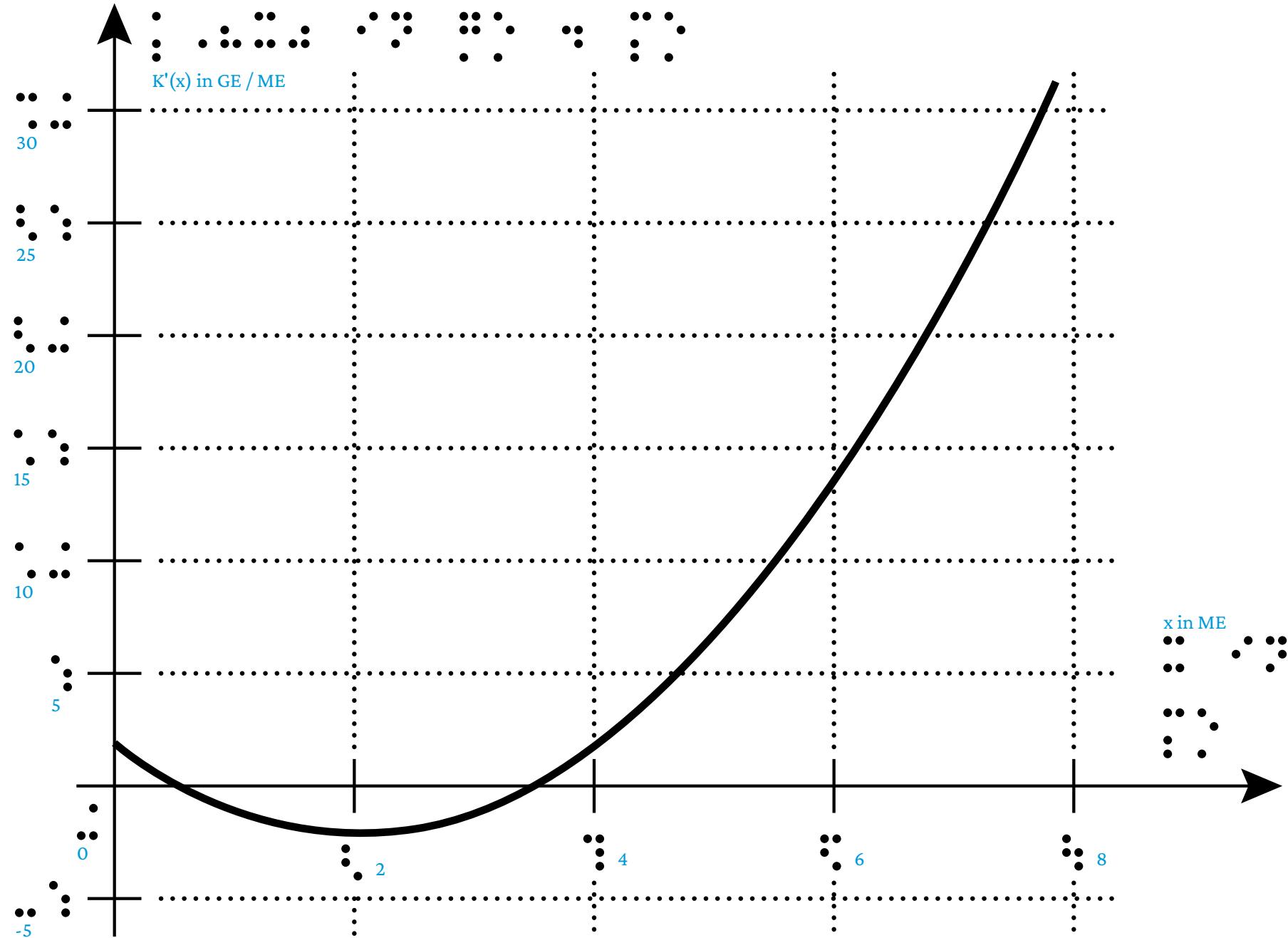
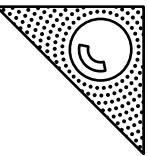


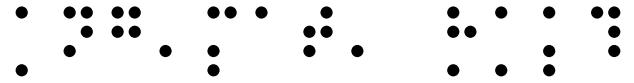
• • • • • • • • •

Ang.Mat. HAK4

• • • • • • • •

S.71 4.17





Ang. Mat. HAK4



S.73 Satz

langfristige Preisuntergrenze

Preisuntergrenze

Preisuntergrenze

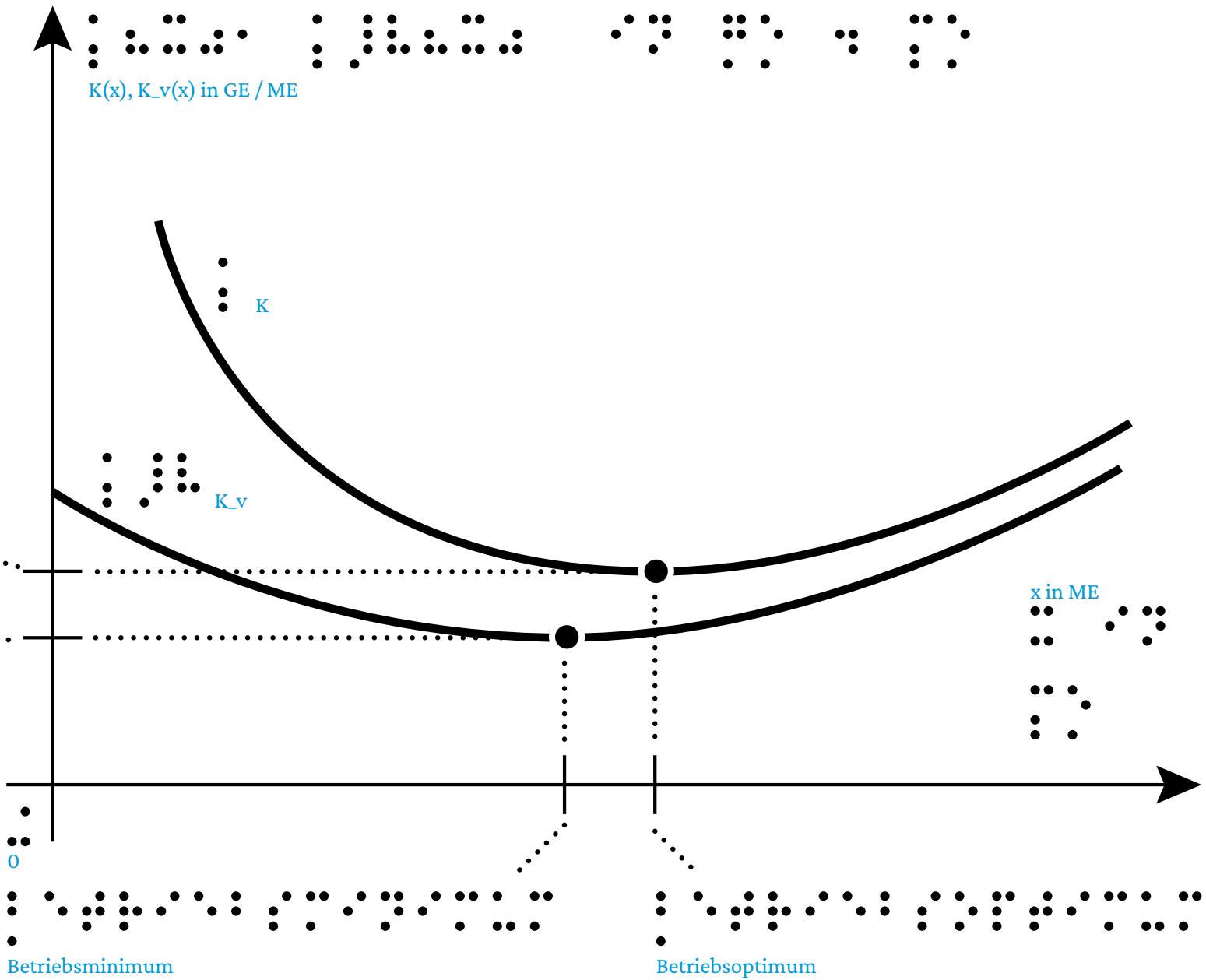
Preisuntergrenze

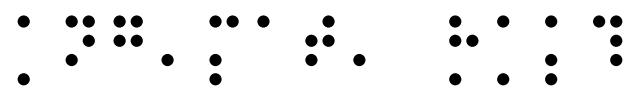
Preisuntergrenze

Preisuntergrenze

Preisuntergrenze

kurzfristige Preisuntergrenze

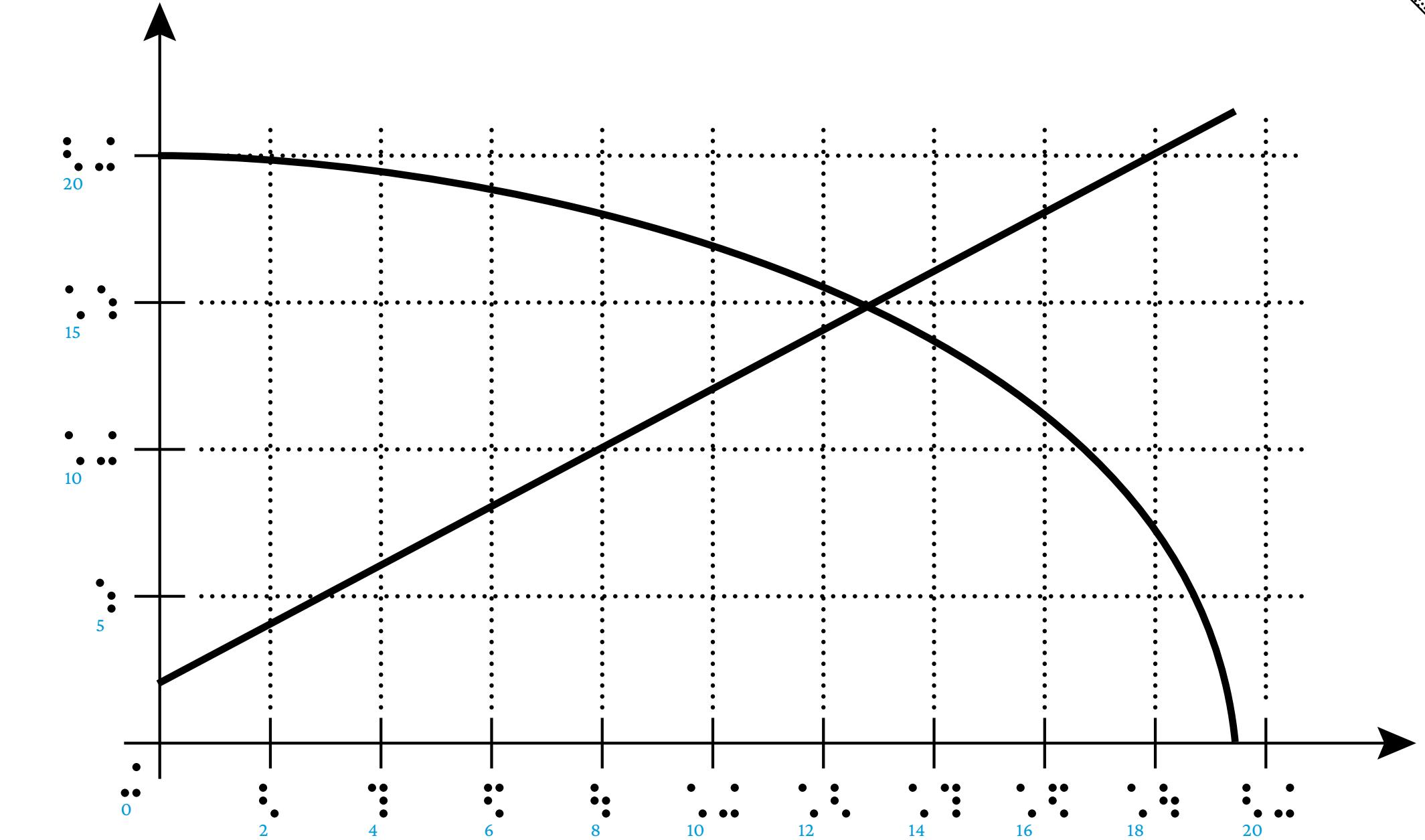
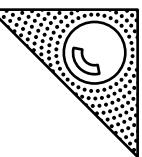


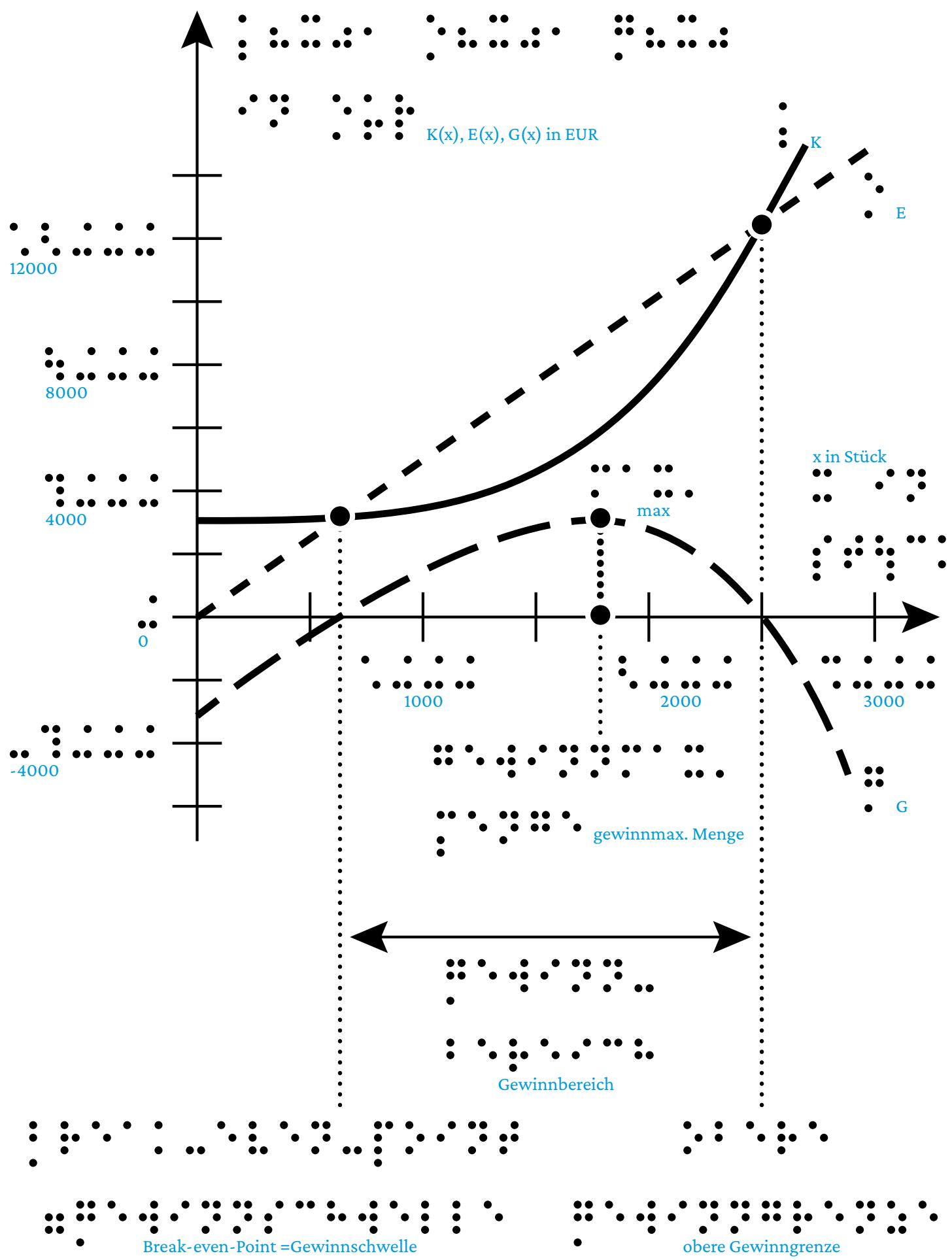


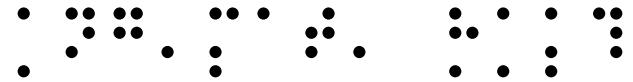
Ang.Mat. HAK4



S.75 4.28



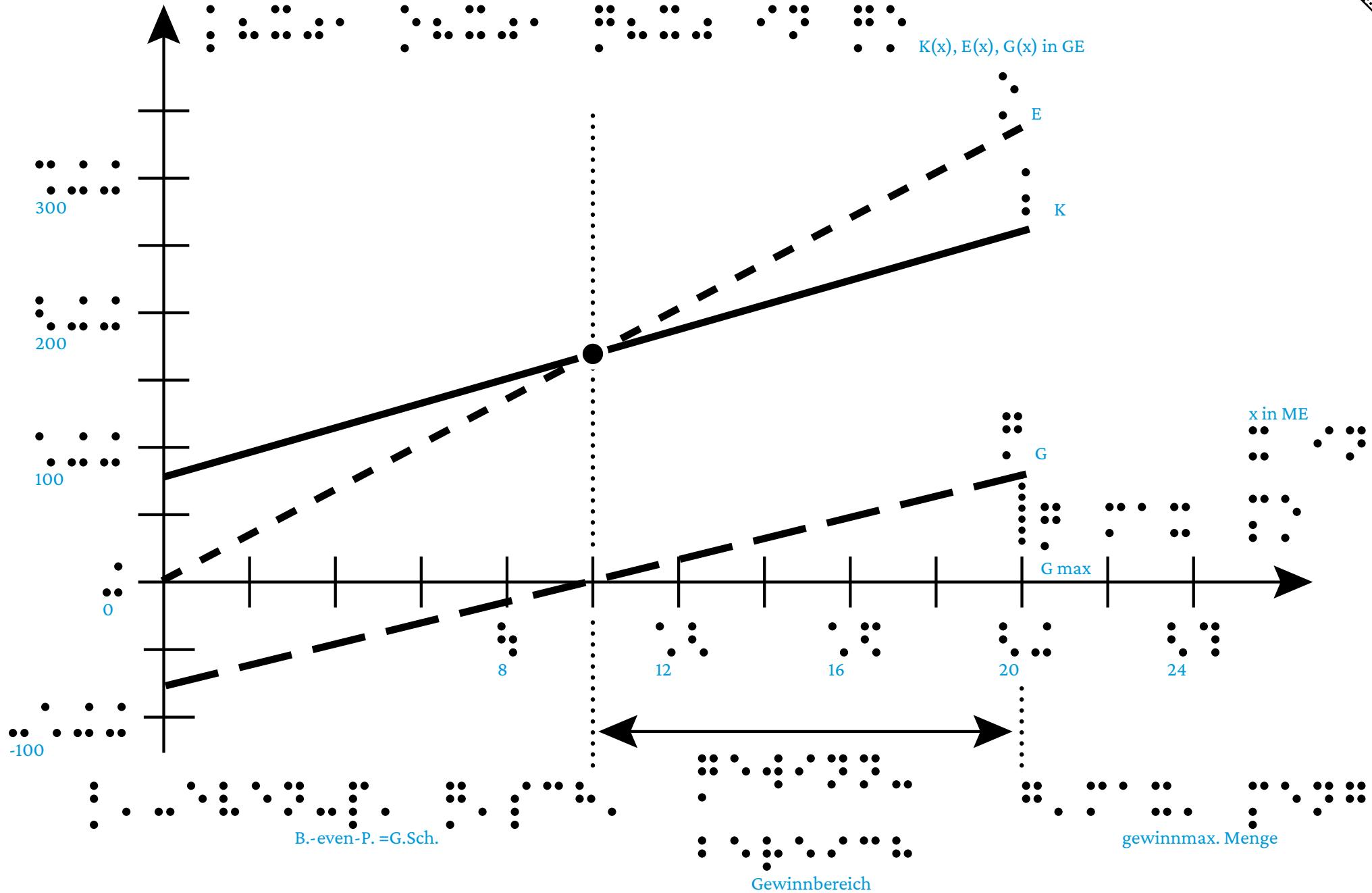
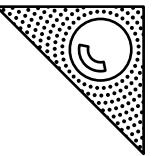


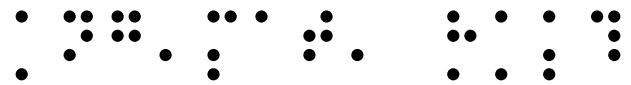


Ang. Mat. HAK4

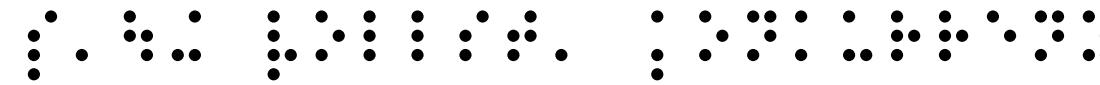


S.78-79 4.42

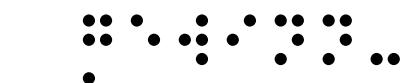




Ang. Mat. HAK4

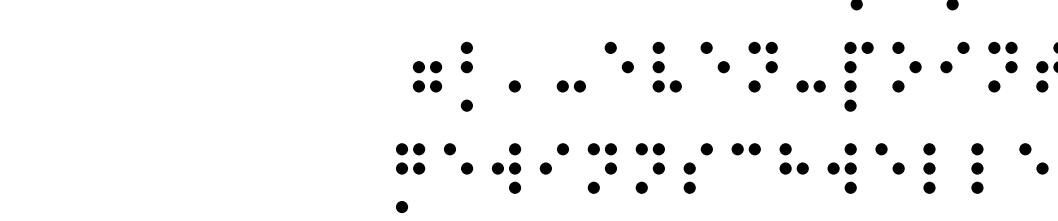


S.80 Vollst. Konkurrenz

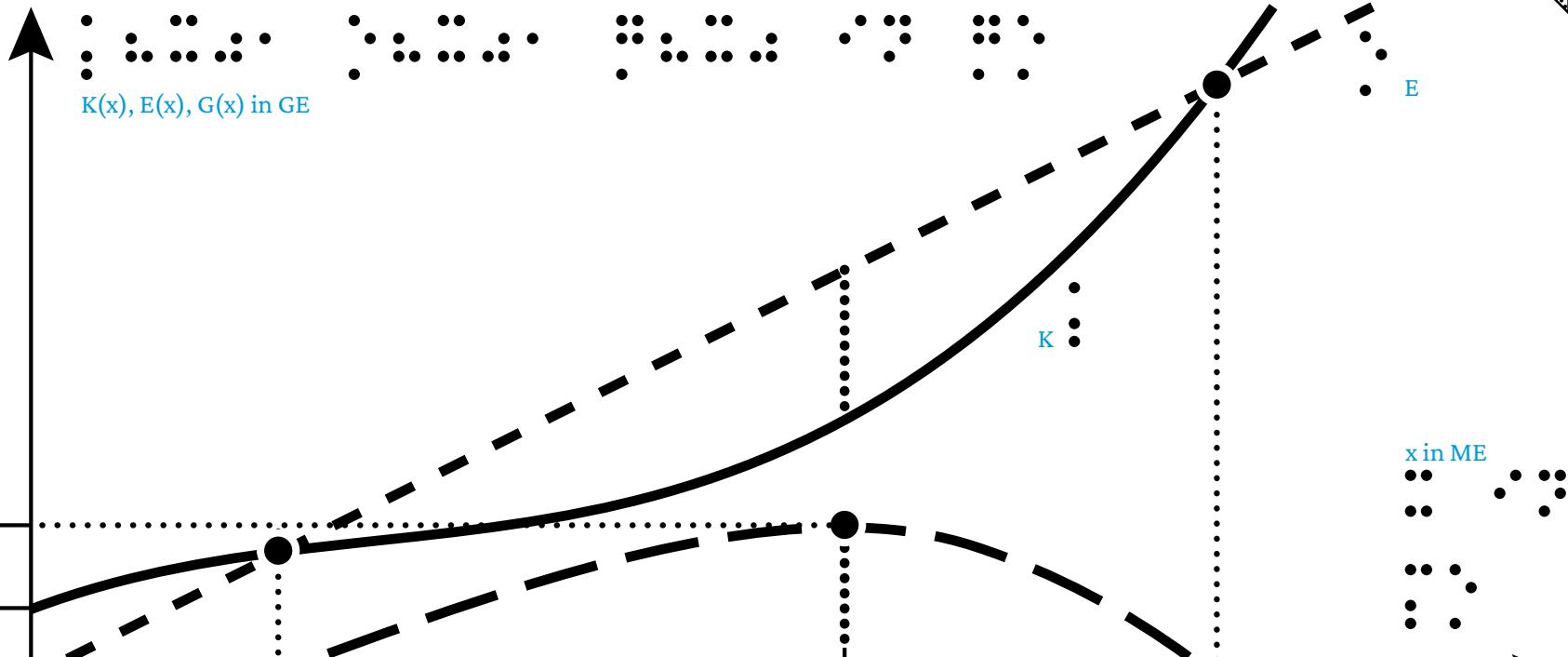


Gewinnmax.

Fixkosten



$K(x)$, $E(x)$, $G(x)$ in GE



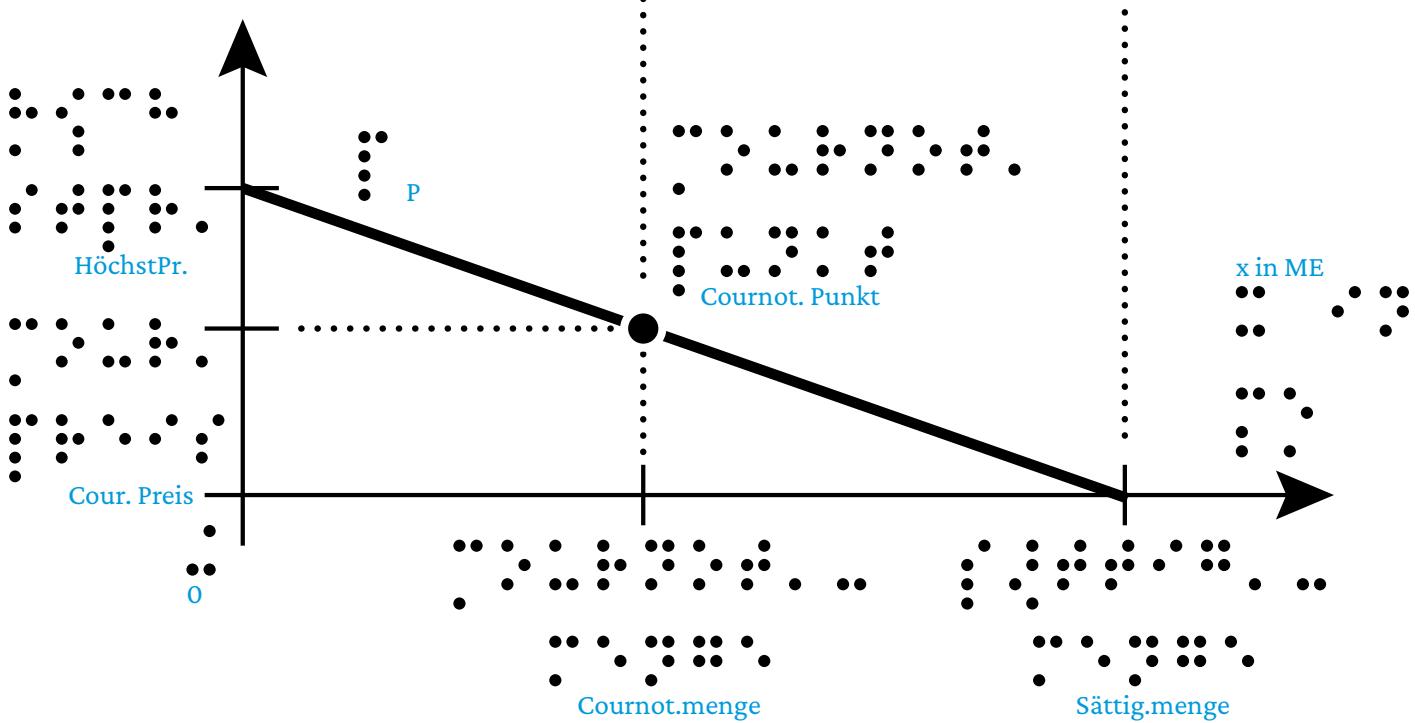
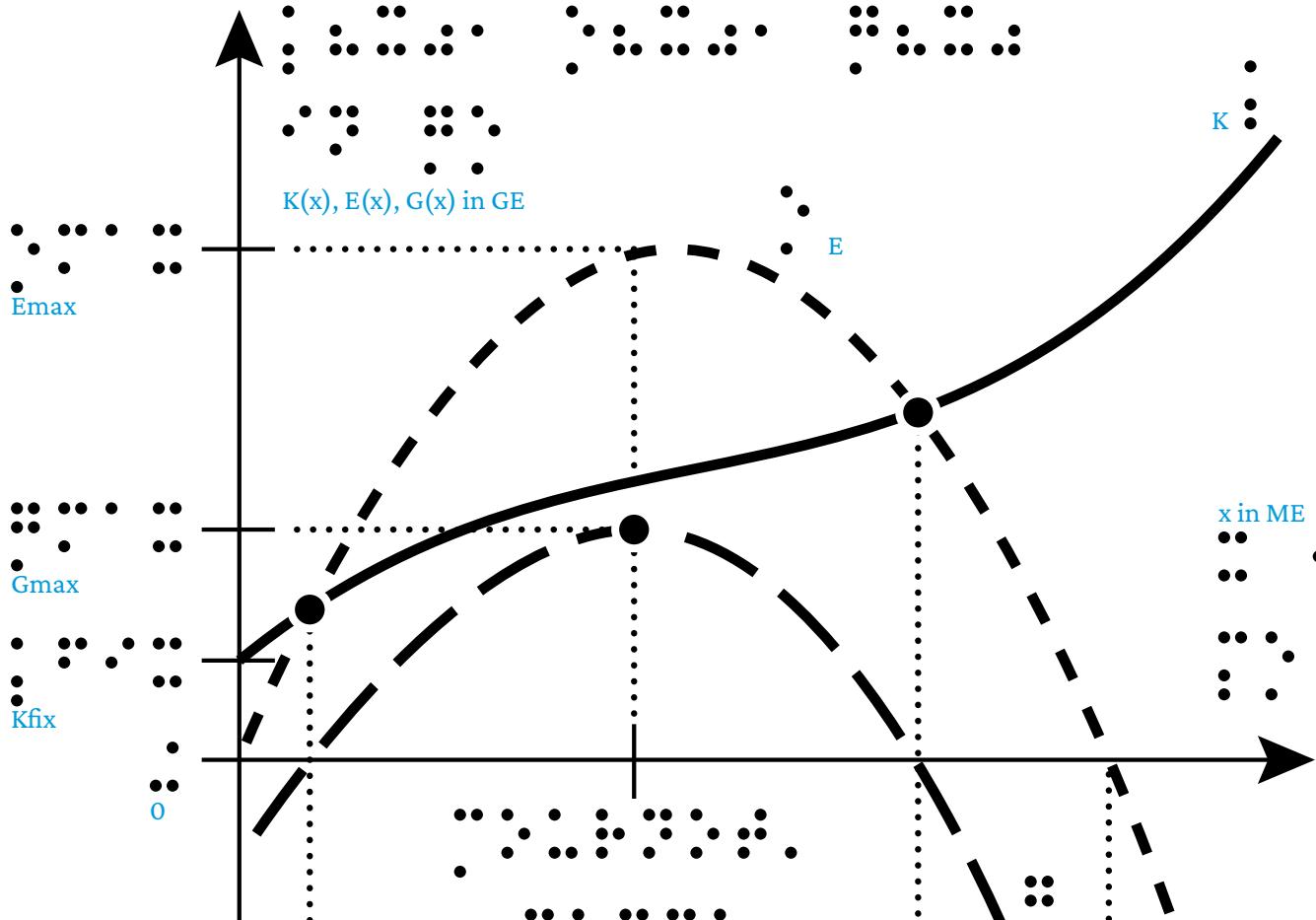
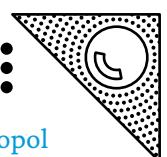
untere G.G.

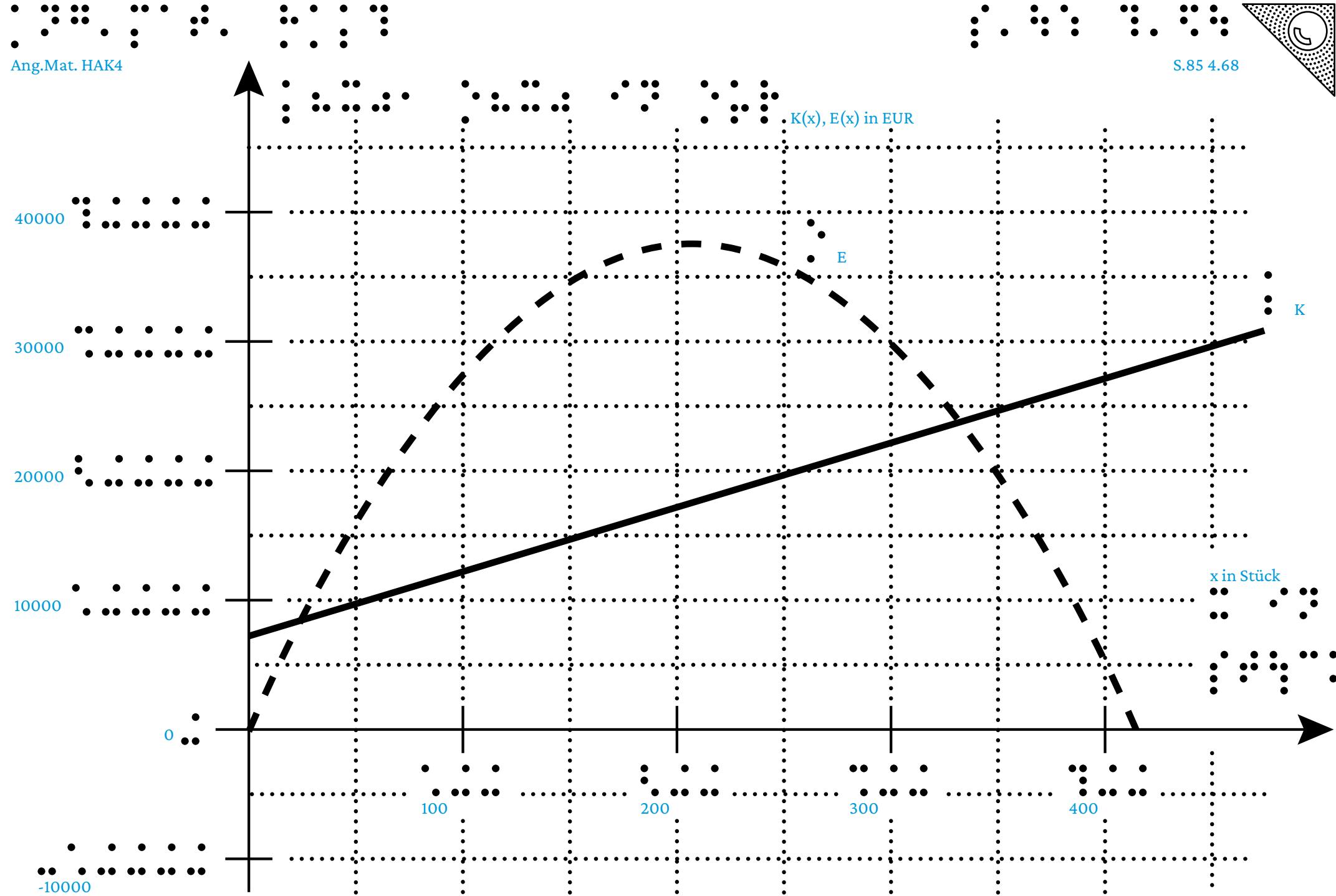
=B.-even-Point

=Gewinnschwelle

x in ME

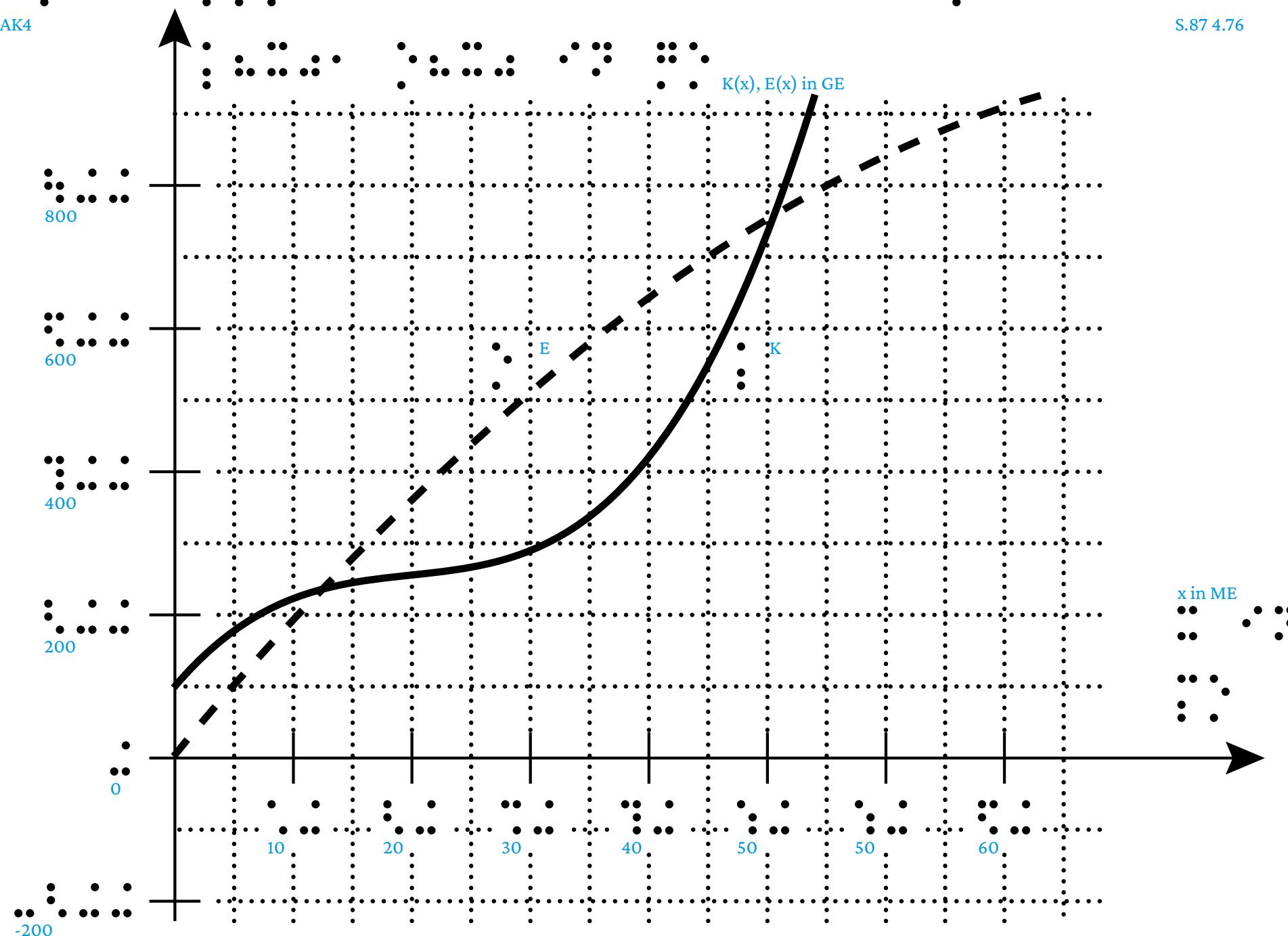
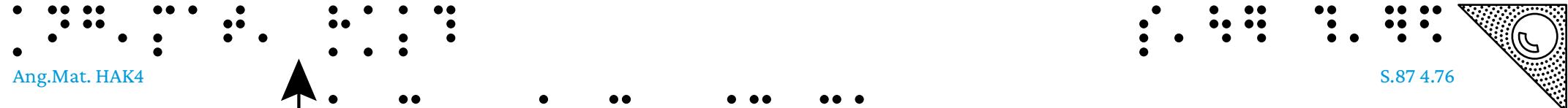
G

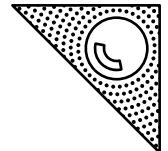




Ang. Mat. HAK4

S.85 4.68





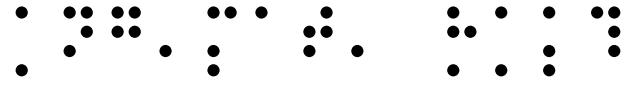
Ang. Mat. HAK4

5. Integralrechnung

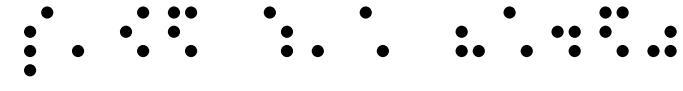
Angewandte Mathematik HAK Band 4

5.

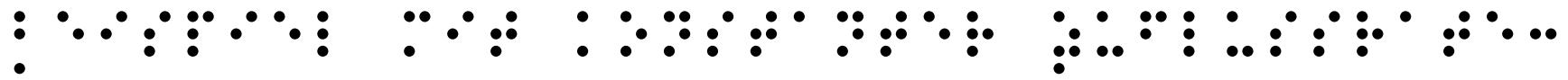
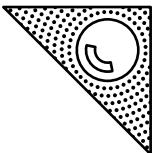
Integralrechnung



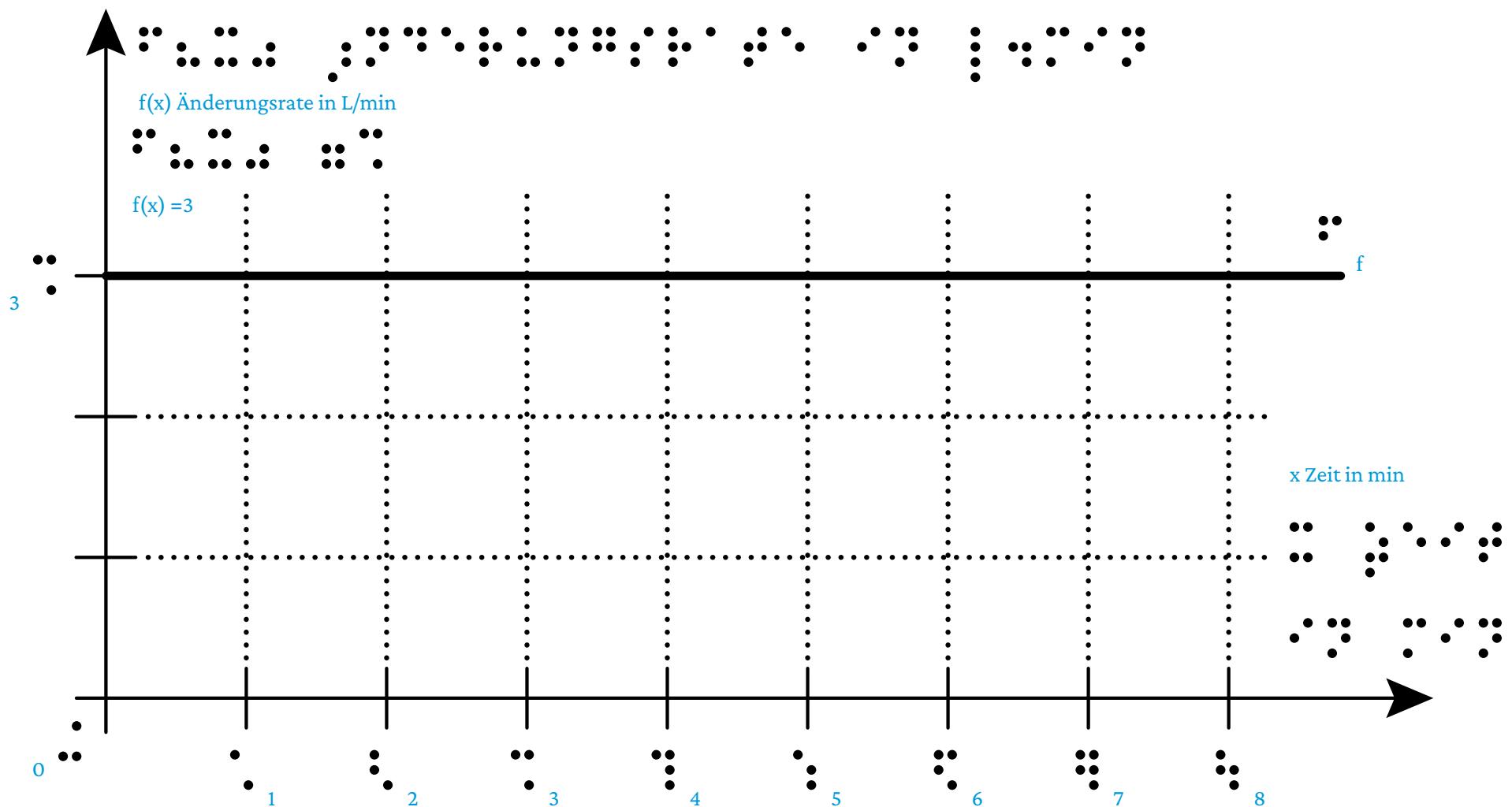
Ang.Mat. HAK4

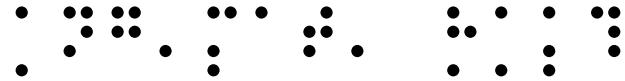


S.96 5.1 (1/6)

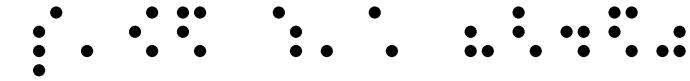


Beispiel mit konstanter Zuflussrate:

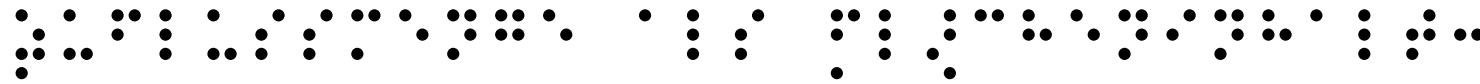
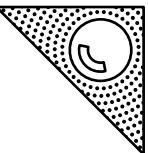




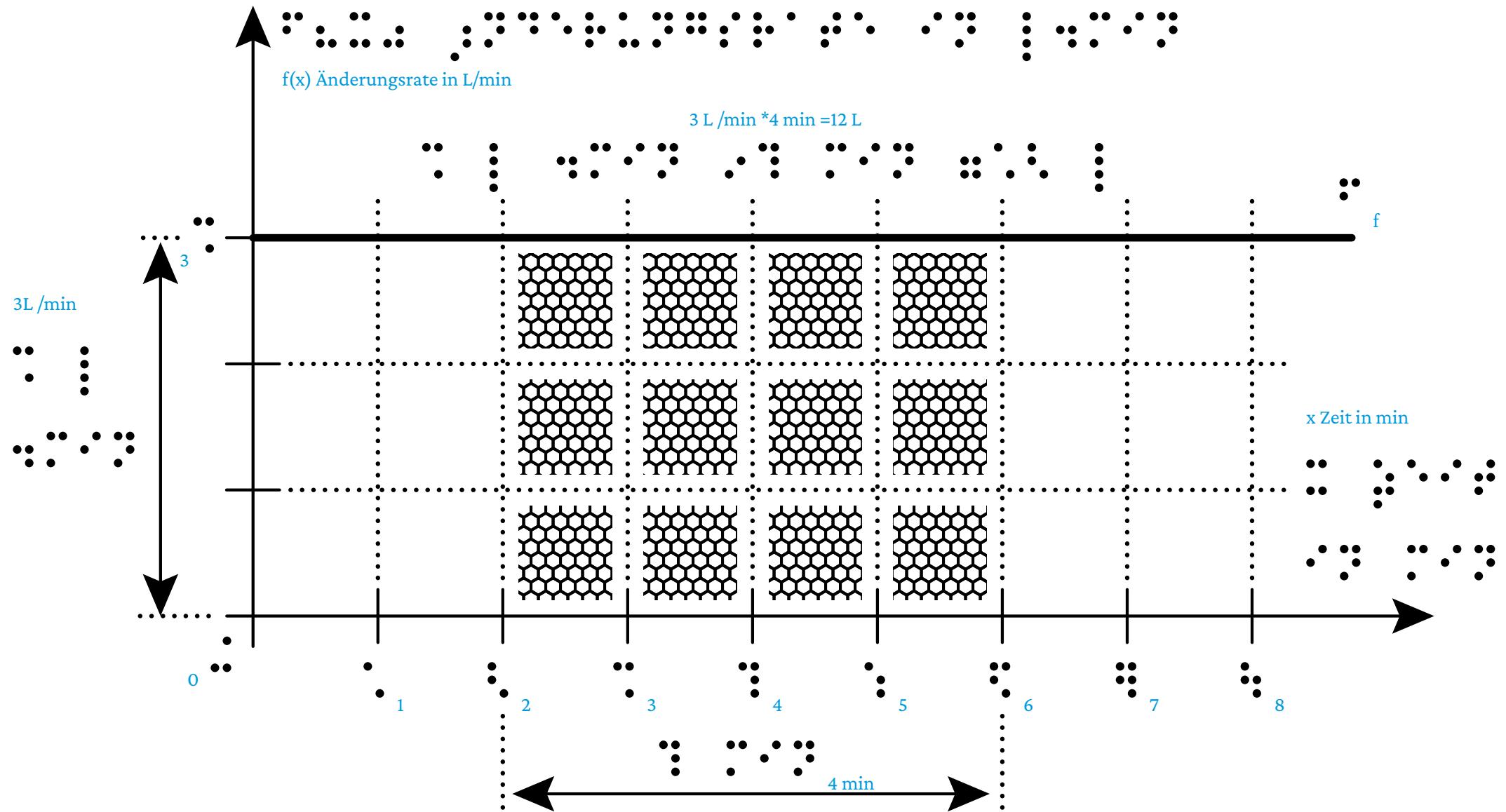
Ang. Mat. HAK4

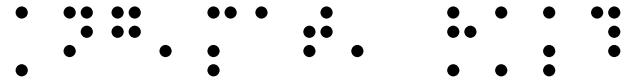


S.96 5.1 (2/6)

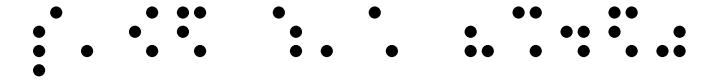


Zuflussmenge als Flächeninhalt:

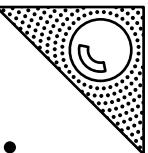




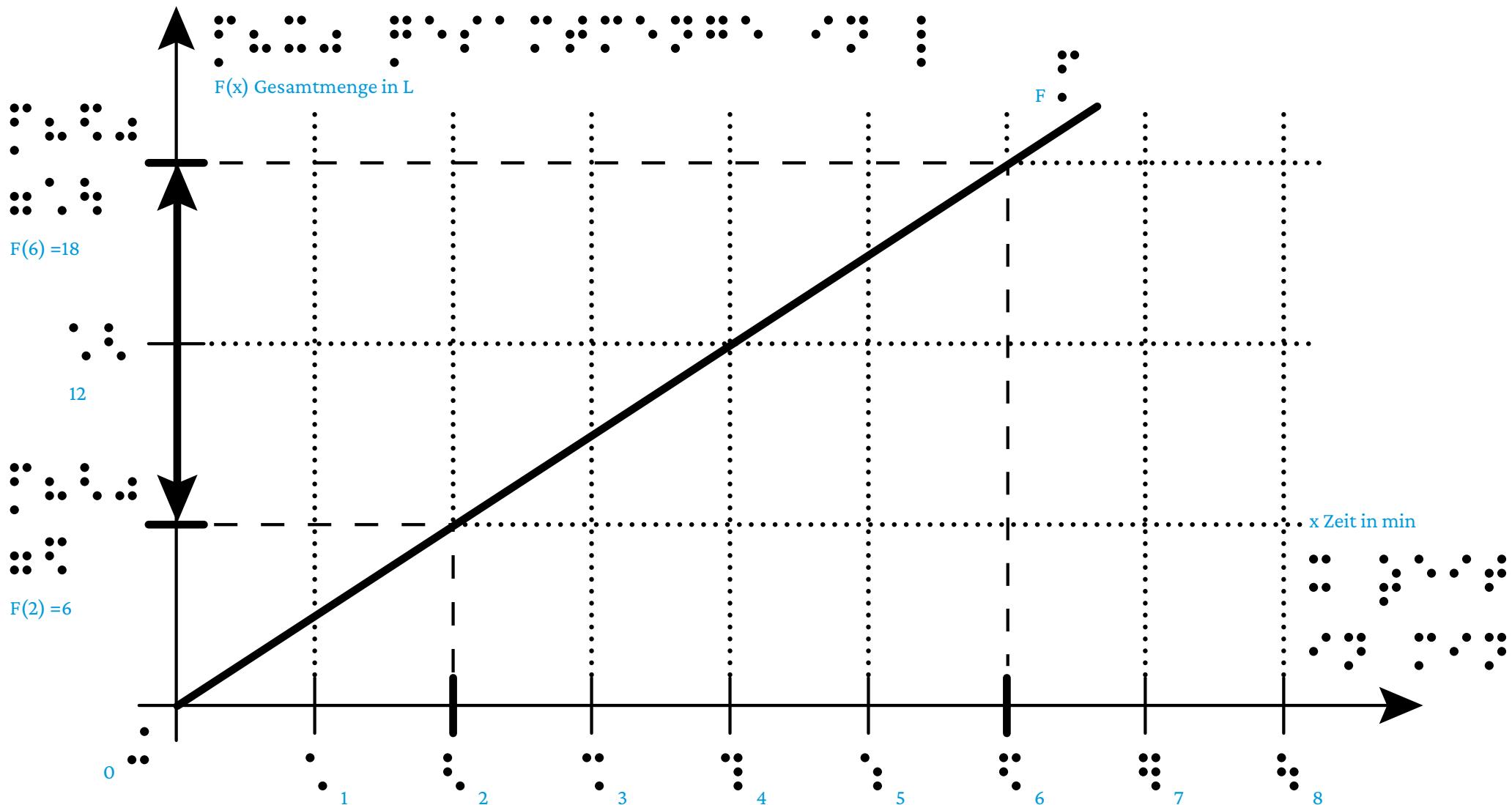
Ang. Mat. HAK4

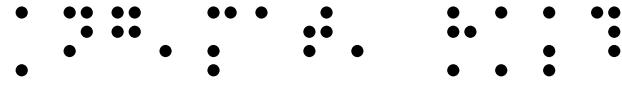


S.96 5.1 (3/6)

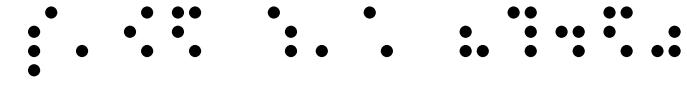


Zuflussmenge mithilfe der Bestandsfunktion

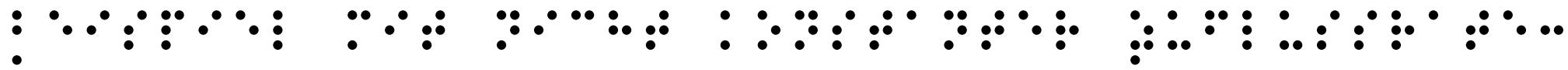
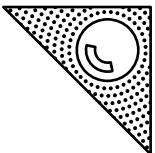




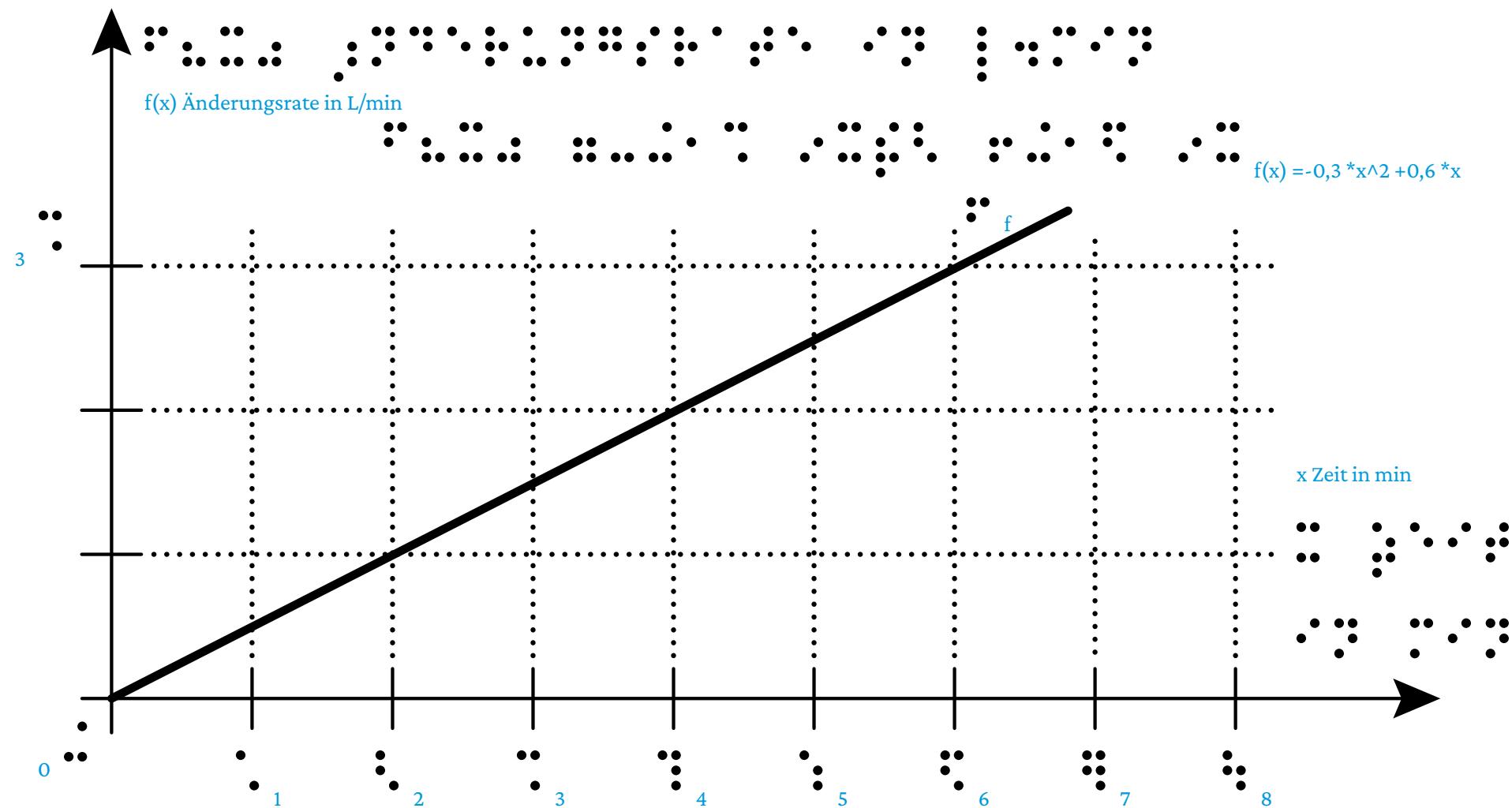
Ang. Mat. HAK4



S.96 5.1 (4/6)

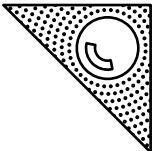


Beispiel mit nicht konstanter Zuflussrate:

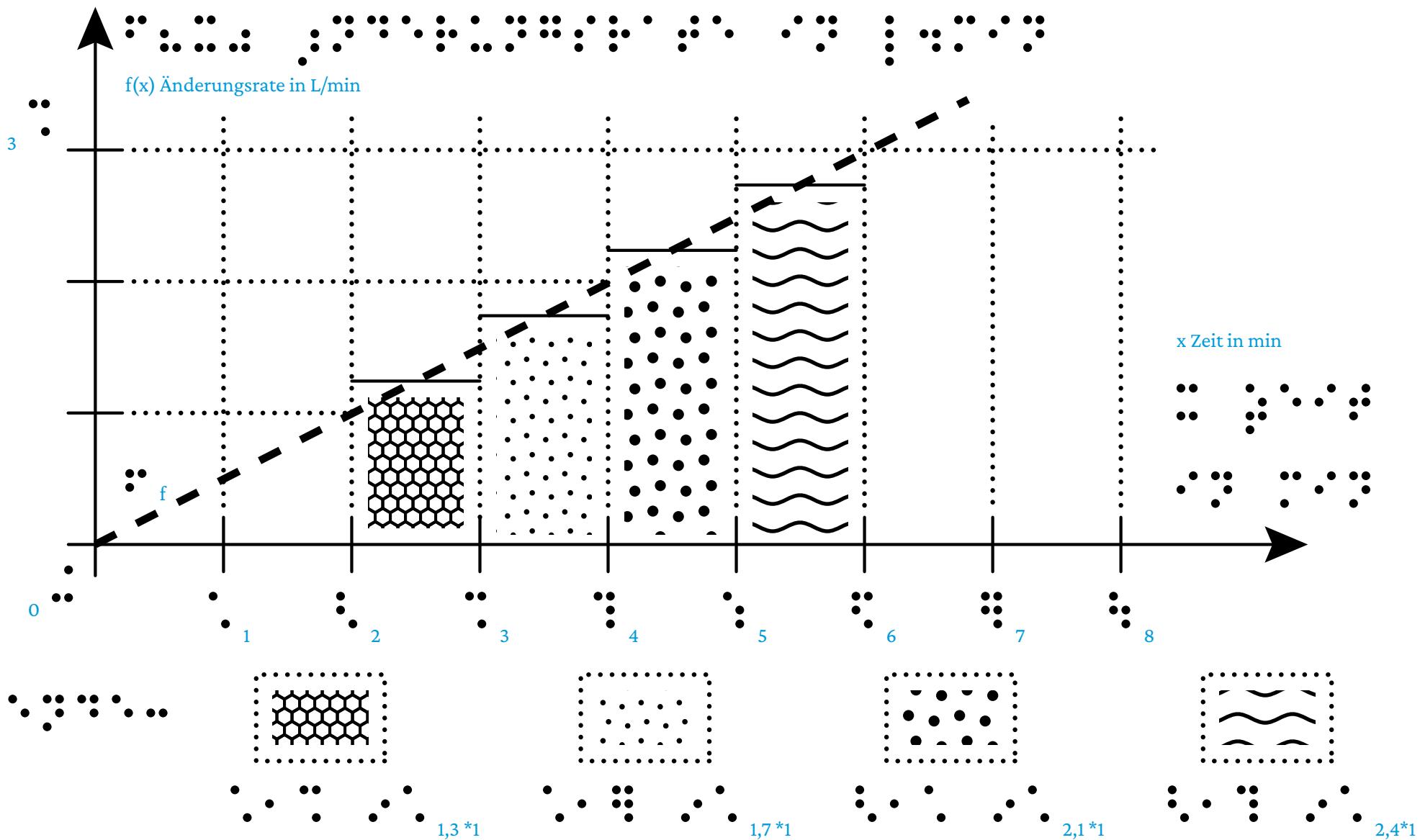


Ang. Mat. HAK4

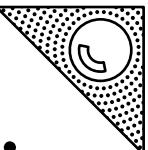
S.96 5.1 (5/6)



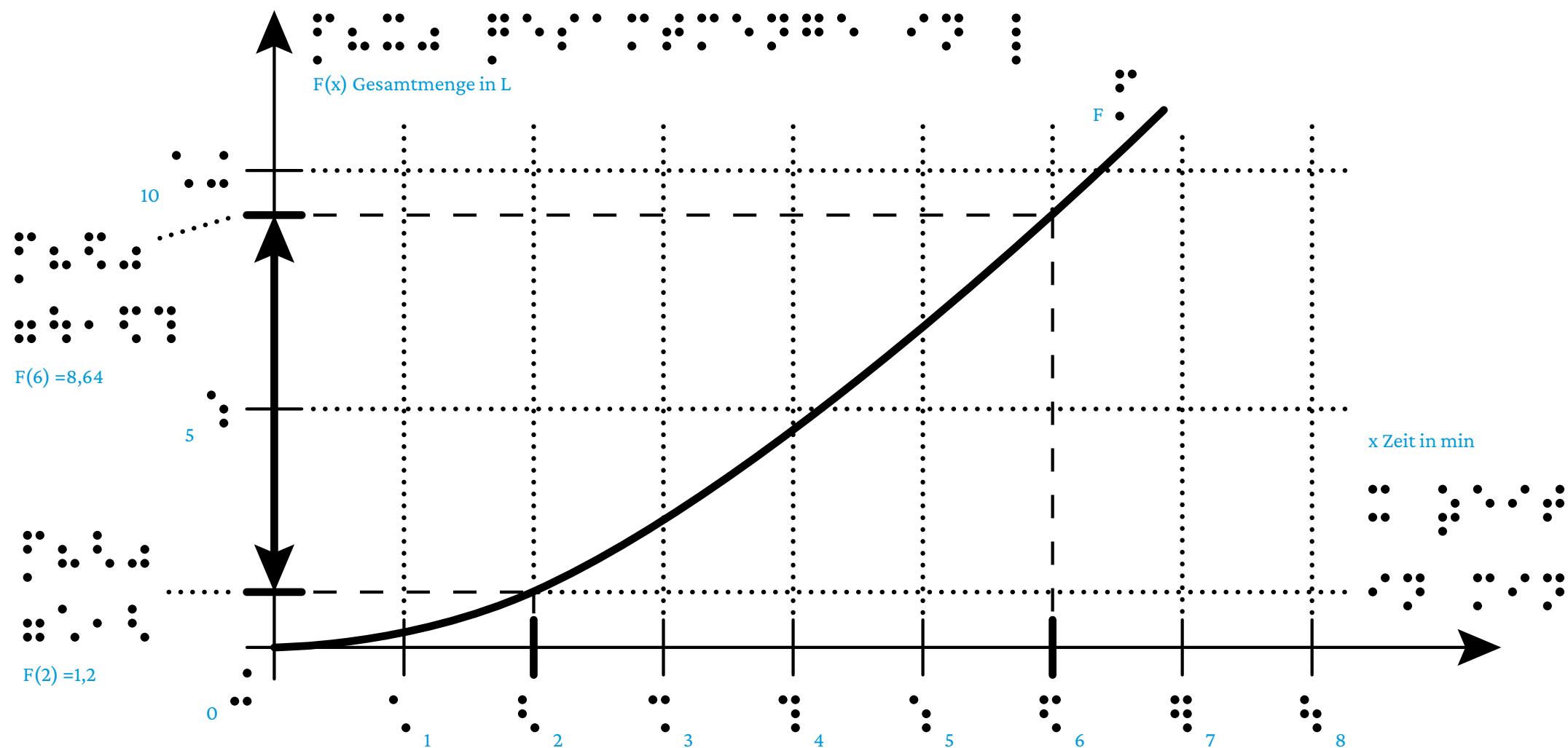
Zuflussmenge als Flächeninhalt:

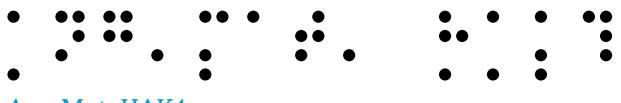


Ang. Mat. HAK4



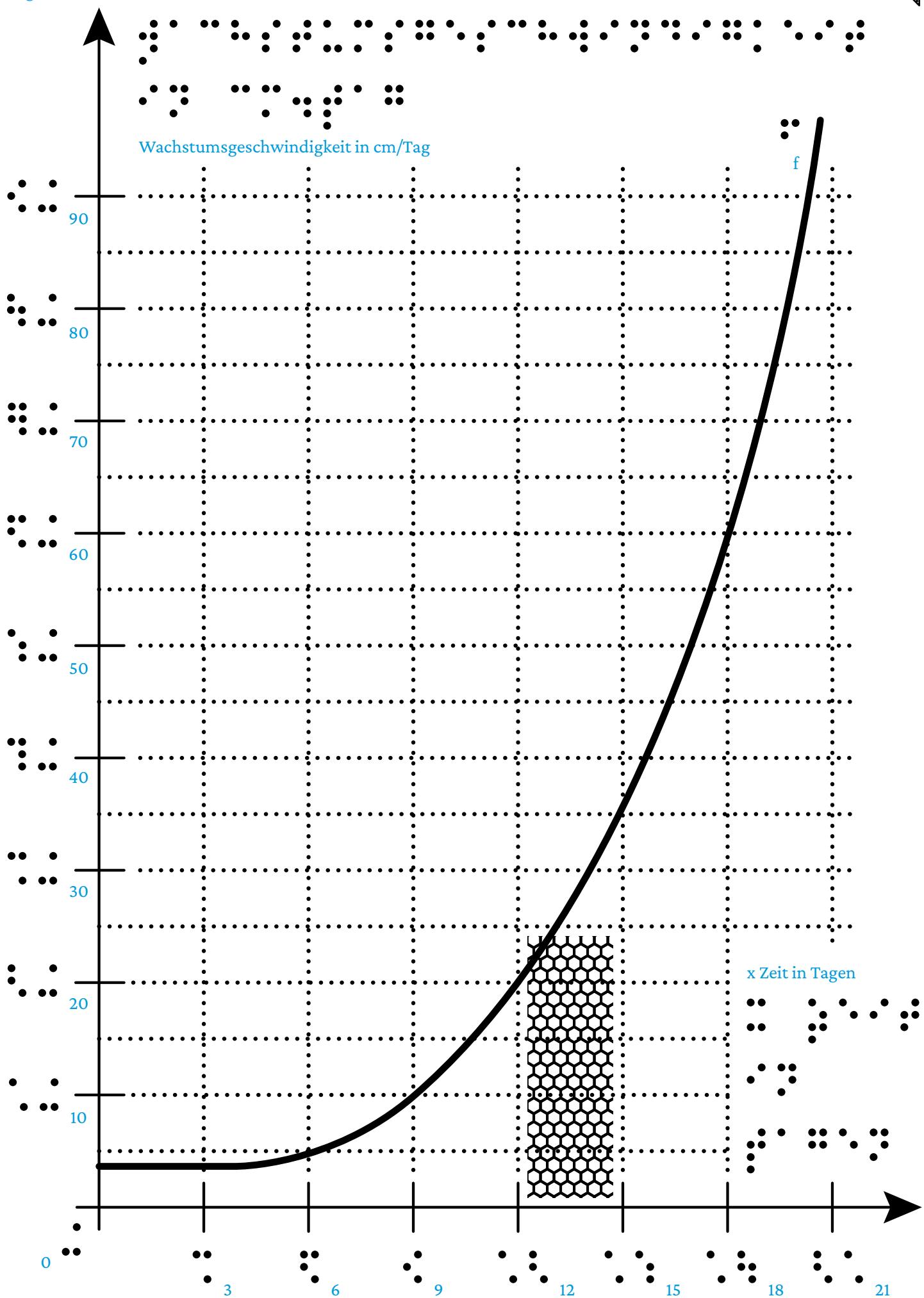
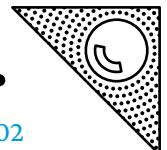
S.96 5.1 (6/6)

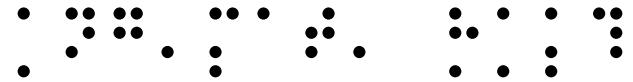




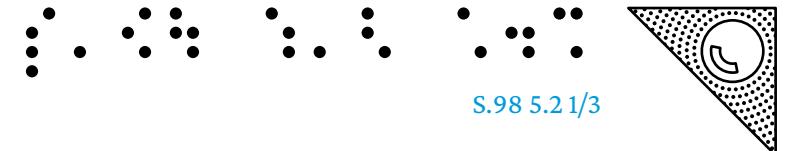
Ang. Mat. HAK4

S.97 5.02

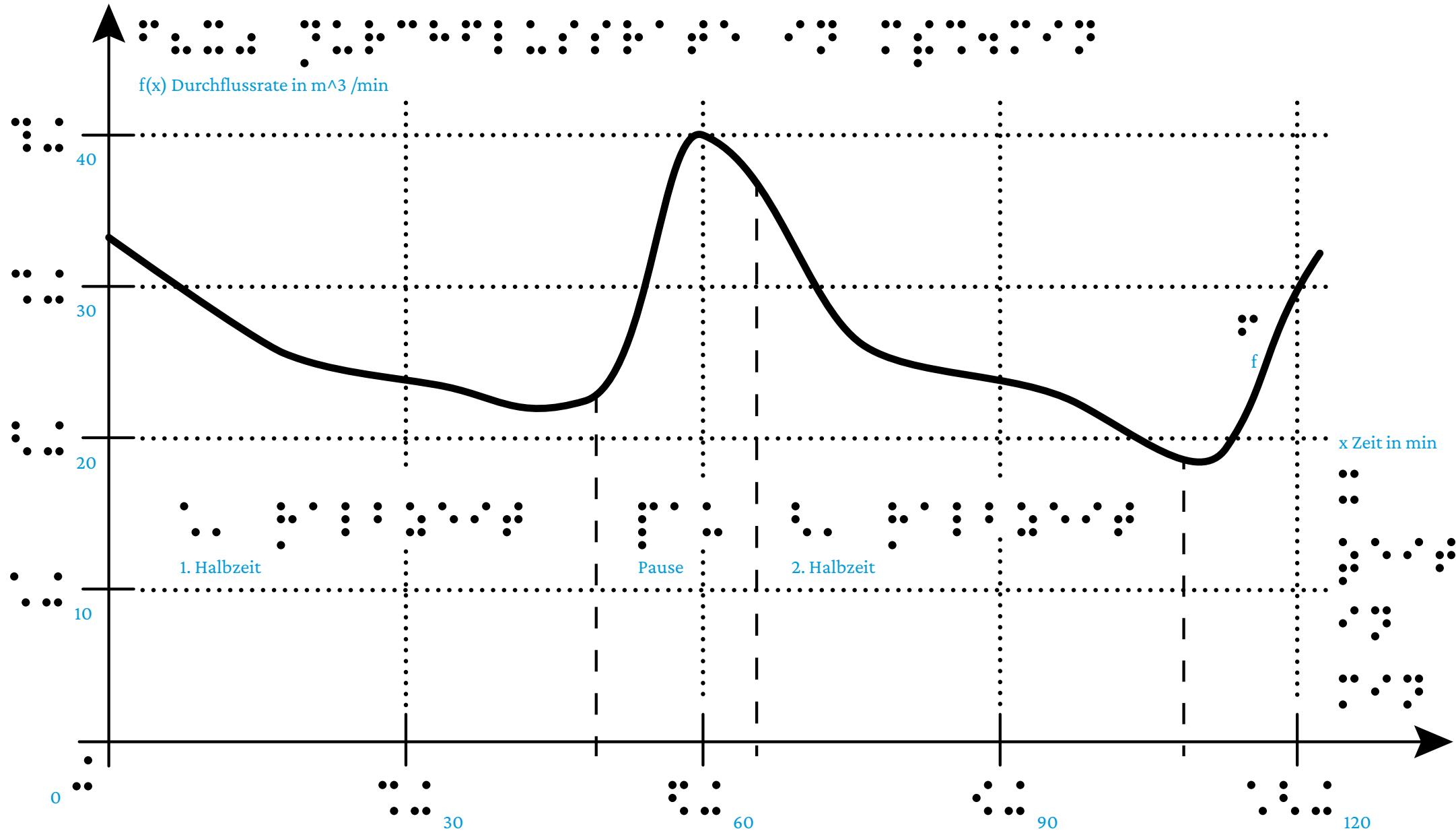
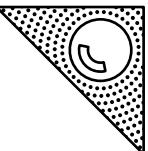




Ang. Mat. HAK4

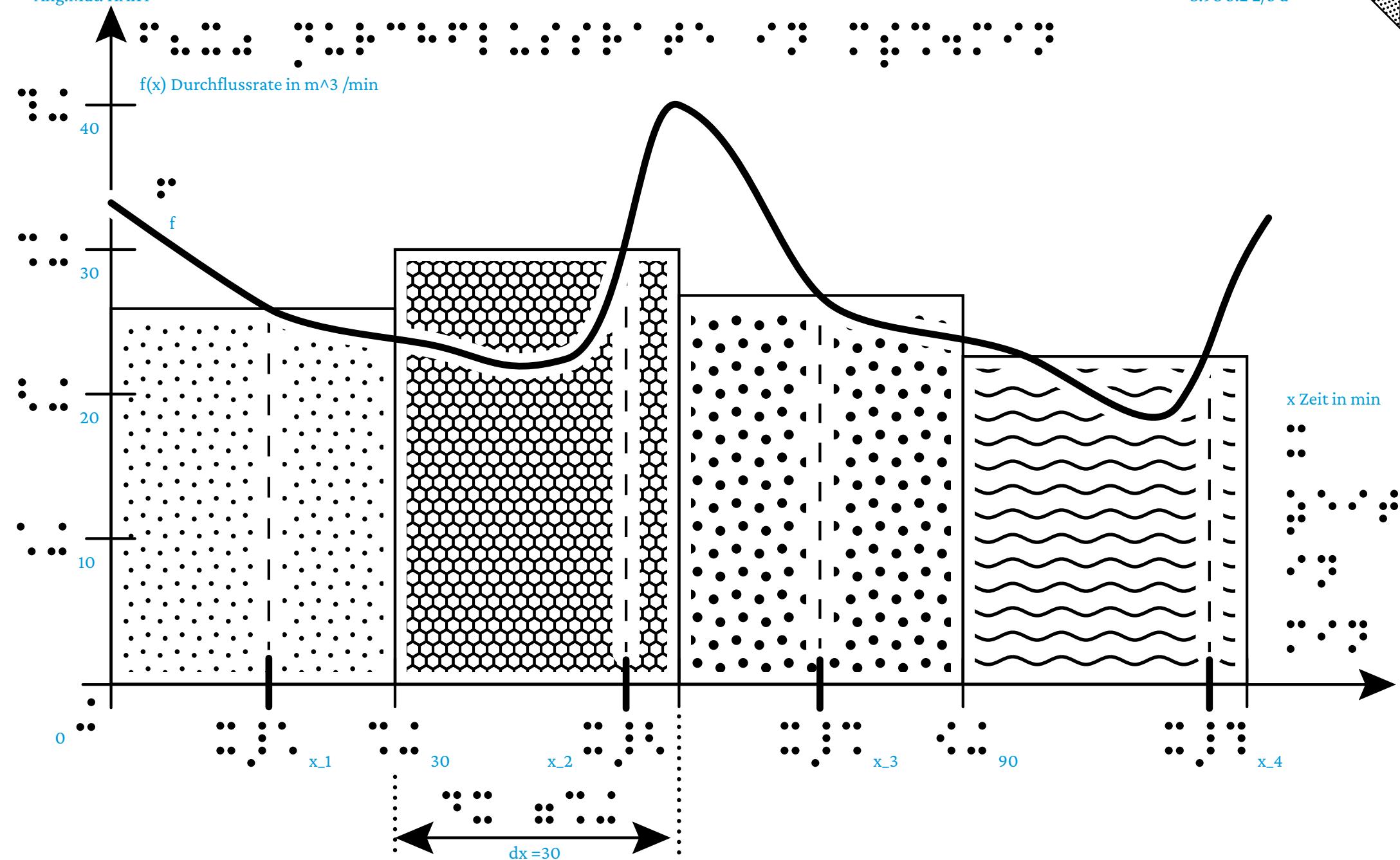
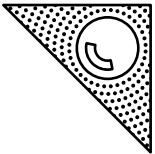


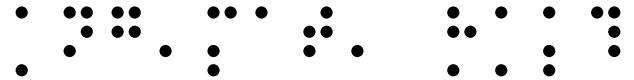
S.98 5.2 1/3



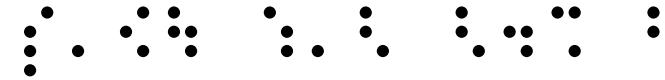
Ang. Mat. HAK4

S.98 5.2 2/3 a

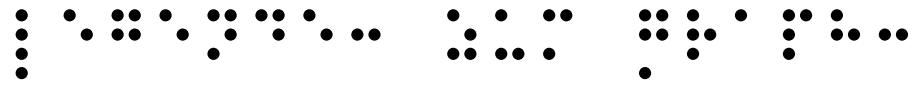
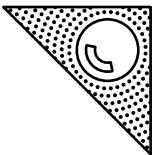




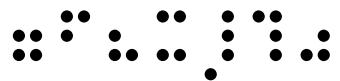
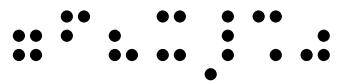
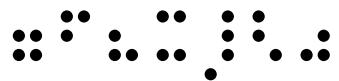
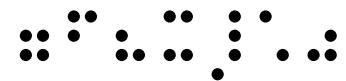
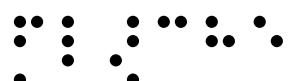
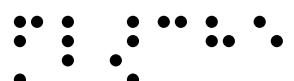
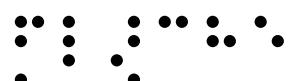
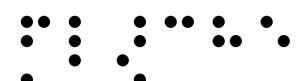
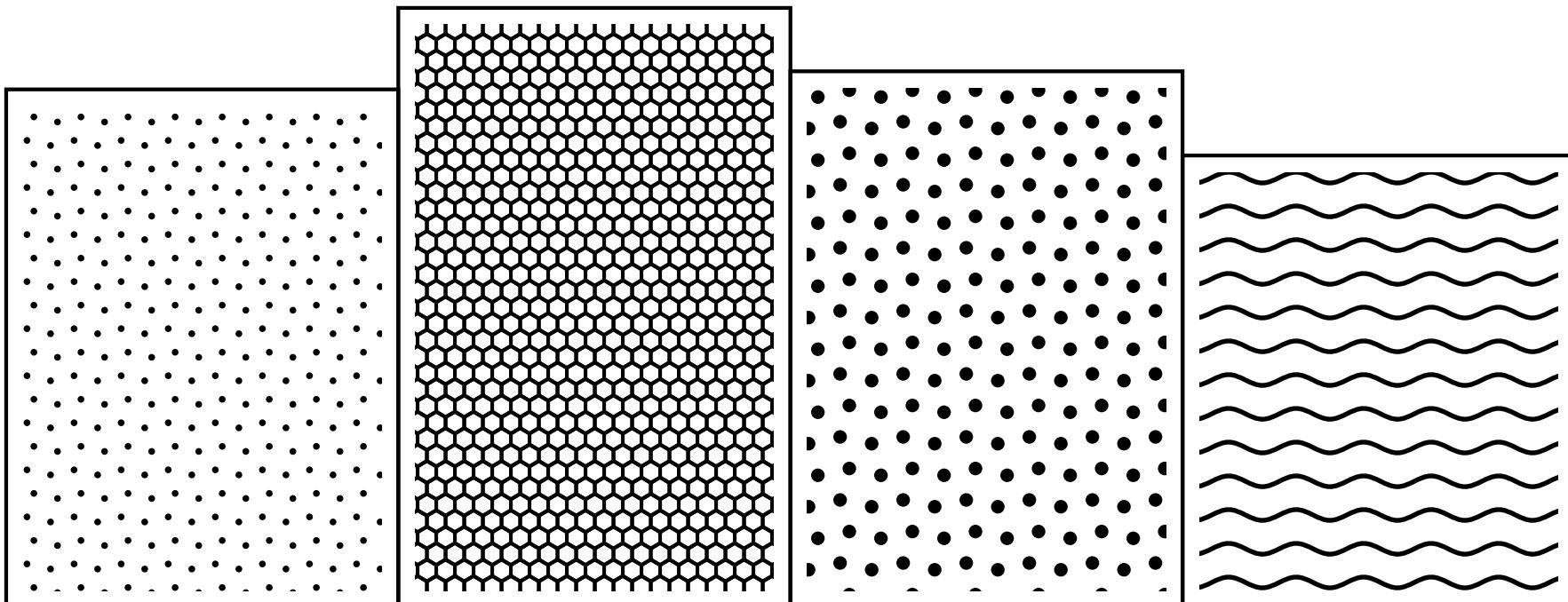
Ang. Mat. HAK4



S.98 5.2 2/3 b



Legende zum Graph:

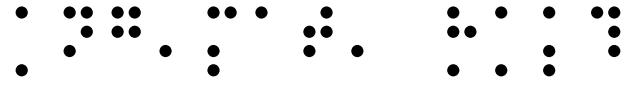


Fläche = $f(x_1) * 30$

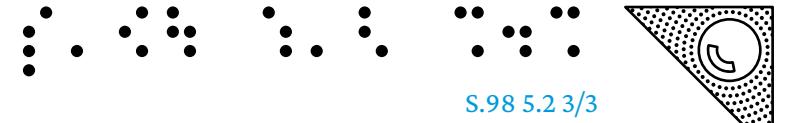
Fläche = $f(x_2) * 30$

Fläche = $f(x_3) * 30$

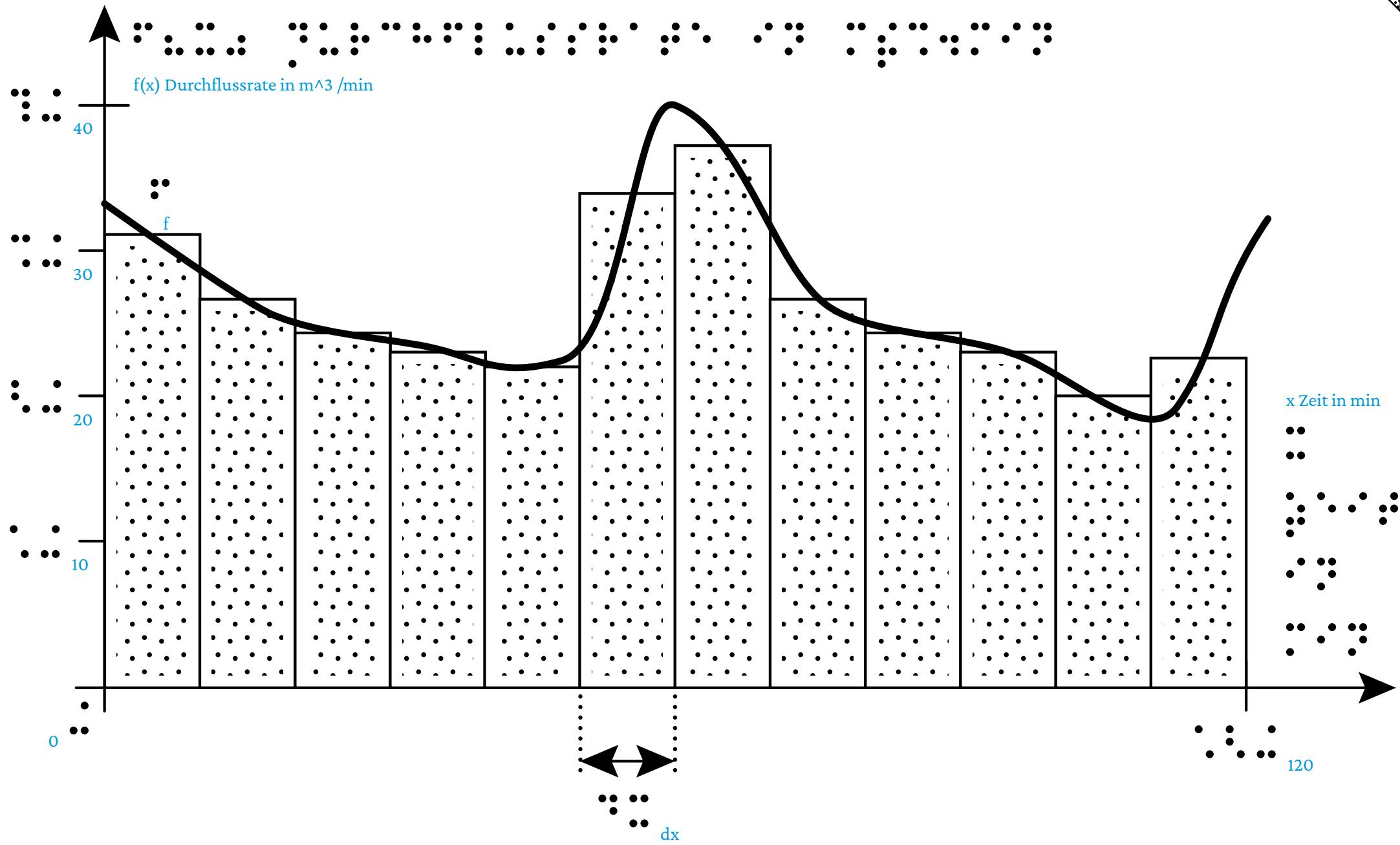
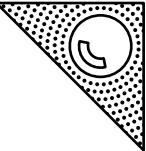
Fläche = $f(x_4) * 30$

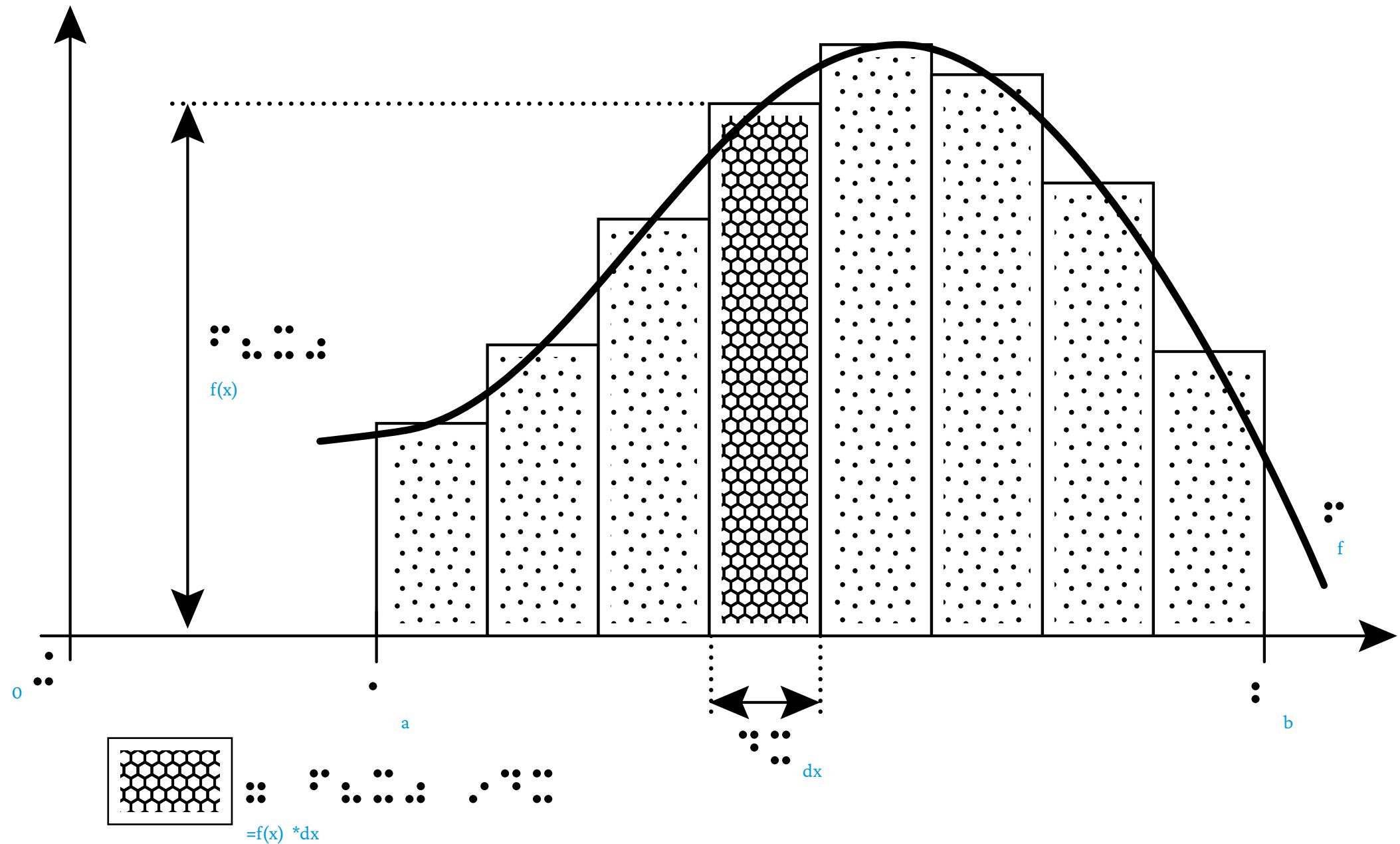
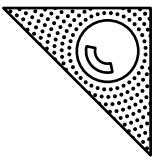
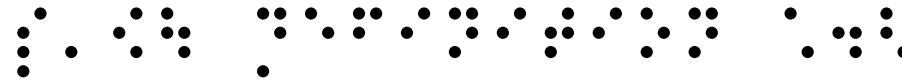
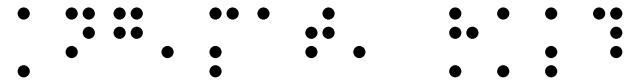


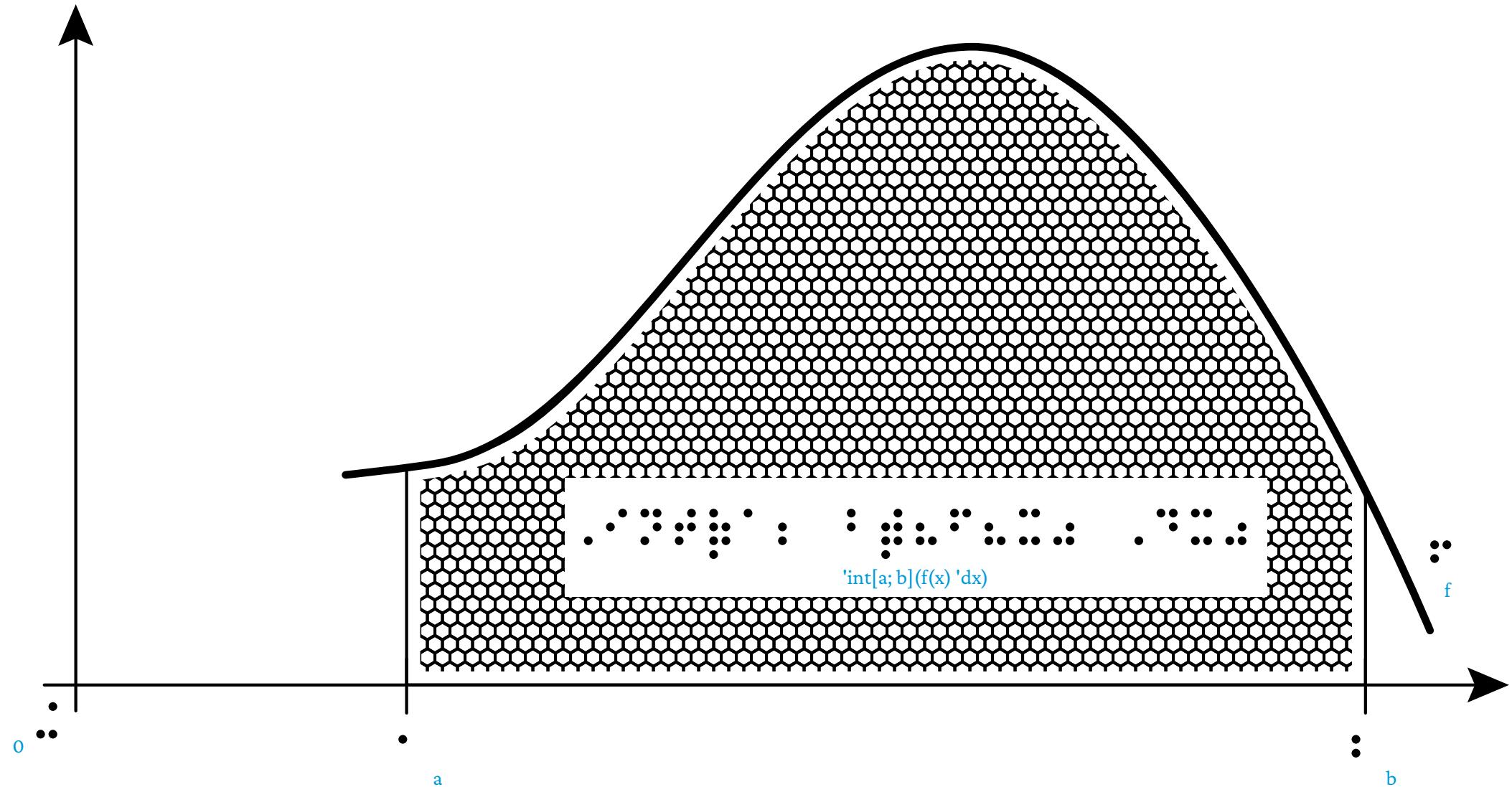
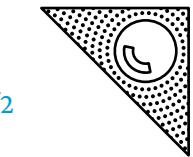
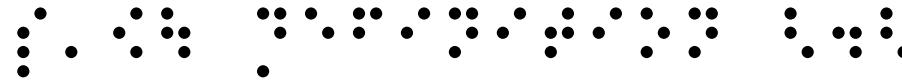
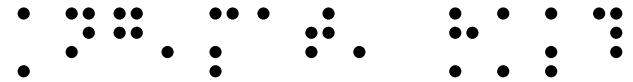
Ang. Mat. HAK4



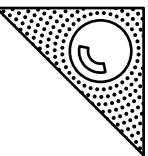
S.98 5.2 3/3







Ang. Mat. HAK4



S.99 5.03

f(x) Durchflussrate in m^3/min

40

30

20

10

0

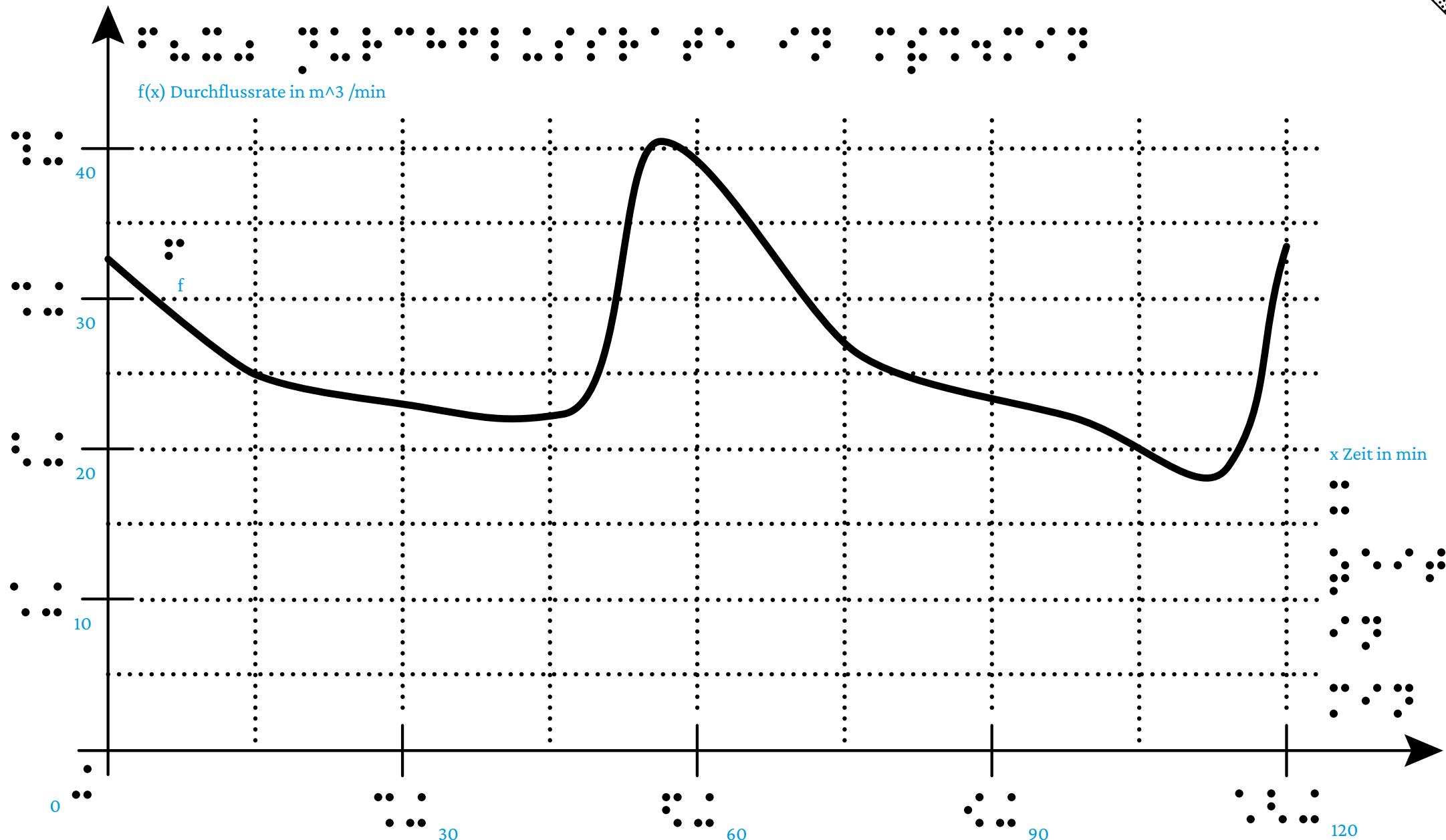
x Zeit in min

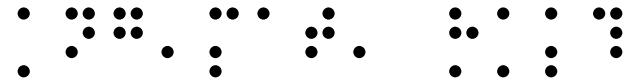
30

60

90

120

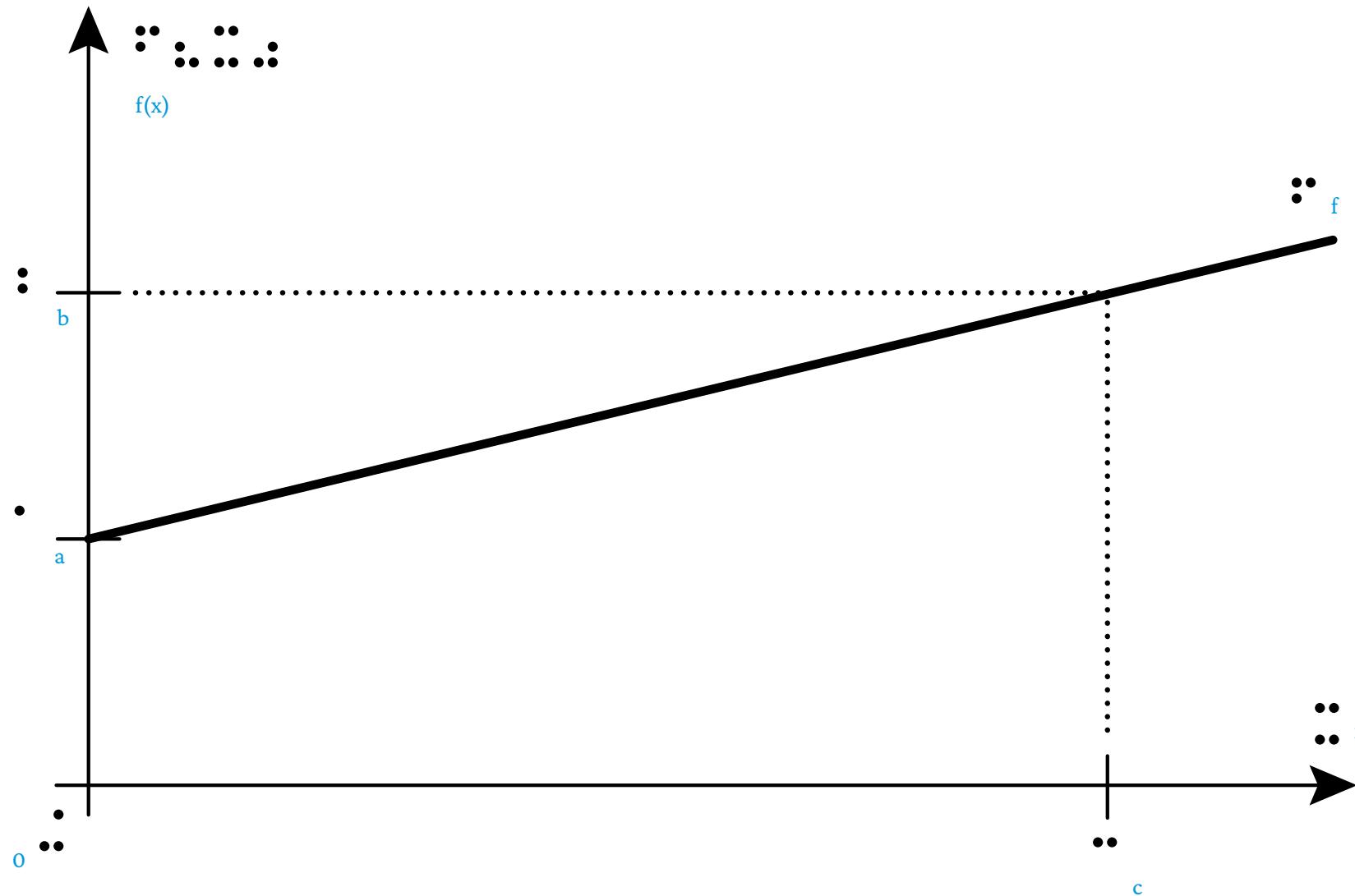
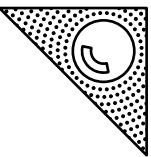




Ang. Mat. HAK4

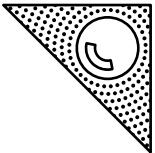


S.99 5.06



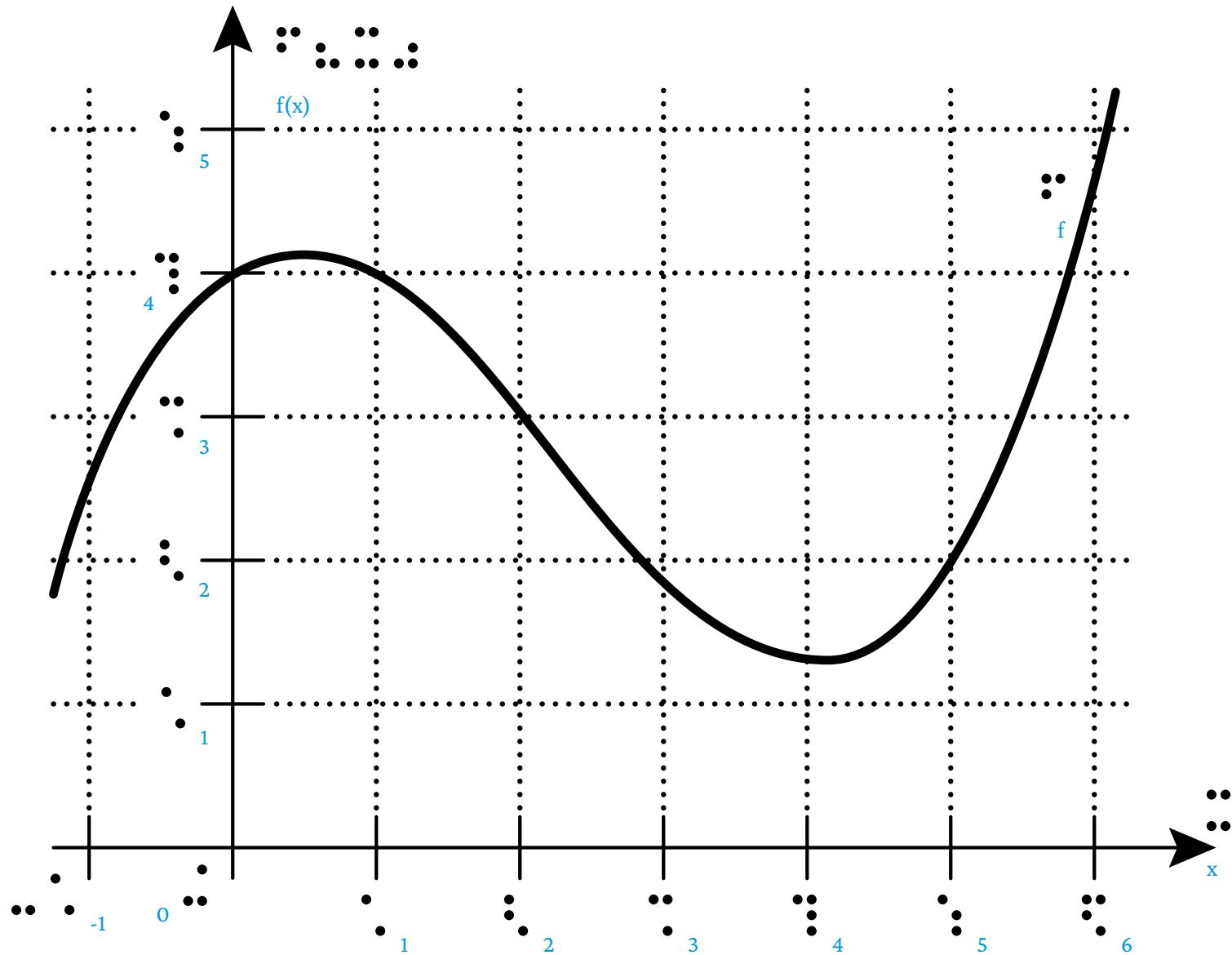
Ang. Mat. HAK4

S.99 5.07 a



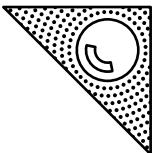
• • • • • • • • • • • • • • • • • • • • • • • • •

'int[0; 5](f(x) 'dx)

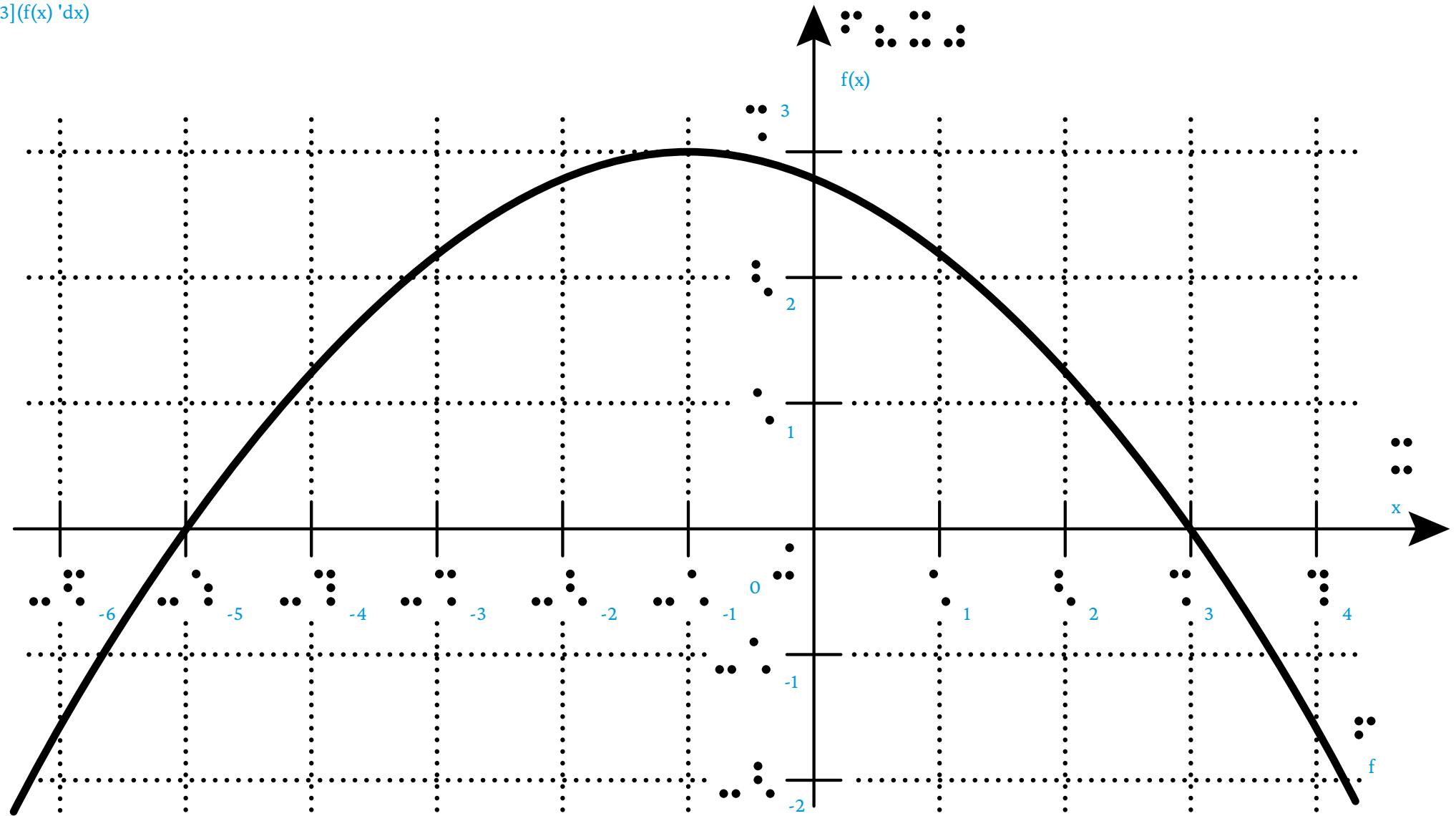


Ang. Mat. HAK4

S.99 5.07 b



'int[-2; 3](f(x) 'dx)



• • • • • • • • •

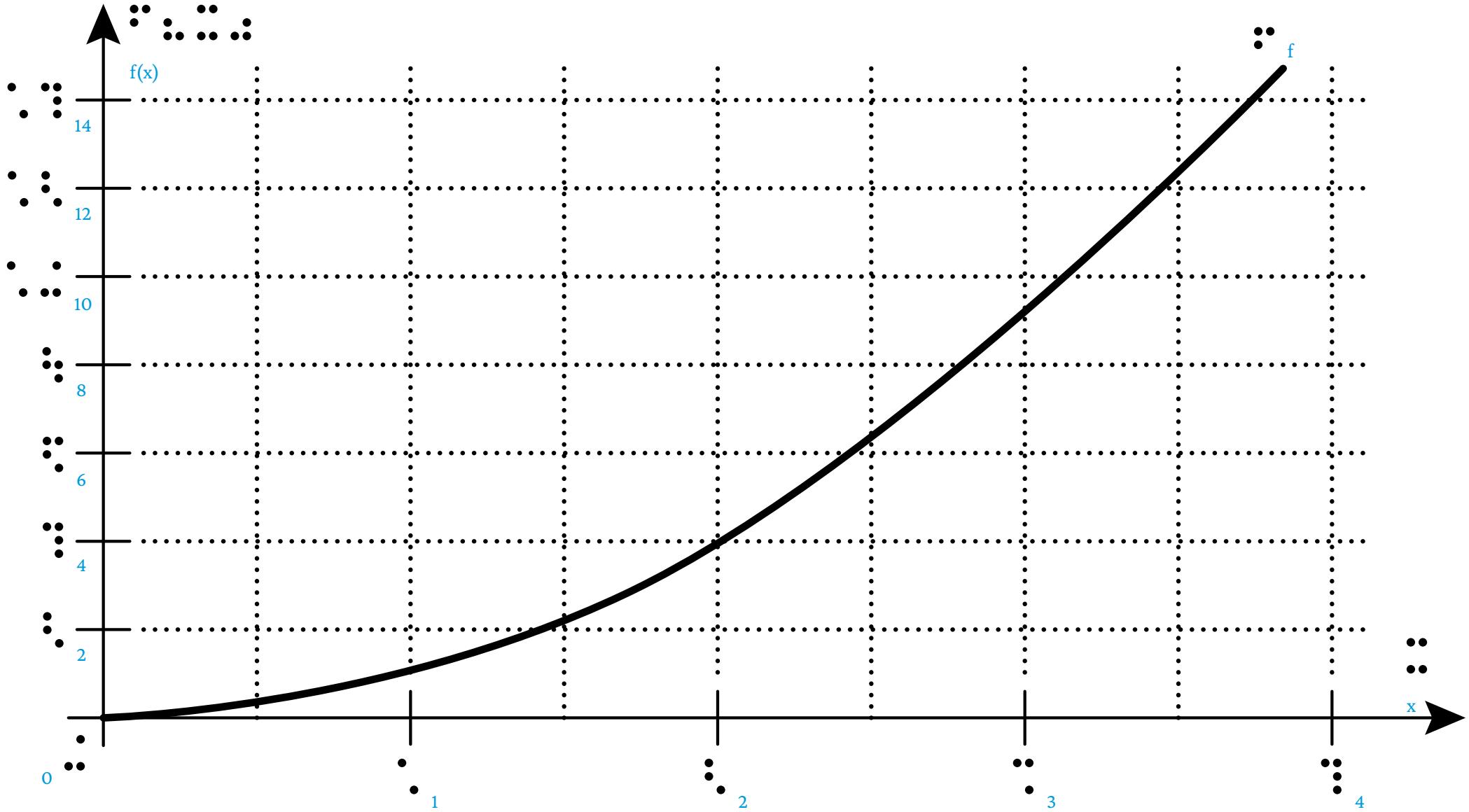
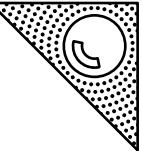
Ang. Mat. HAK4

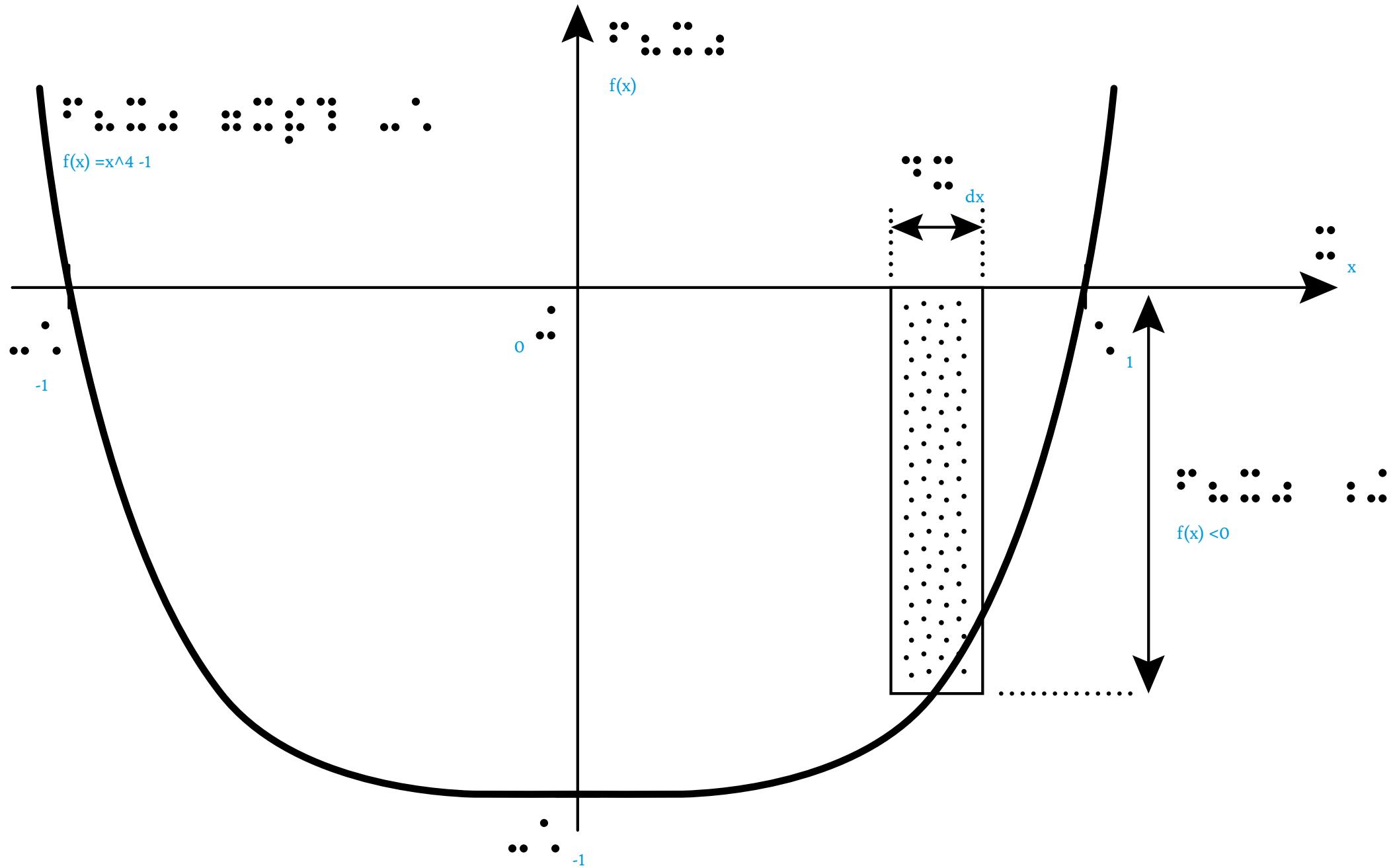
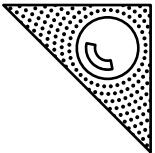
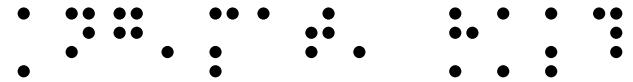
• • • • • • • • •

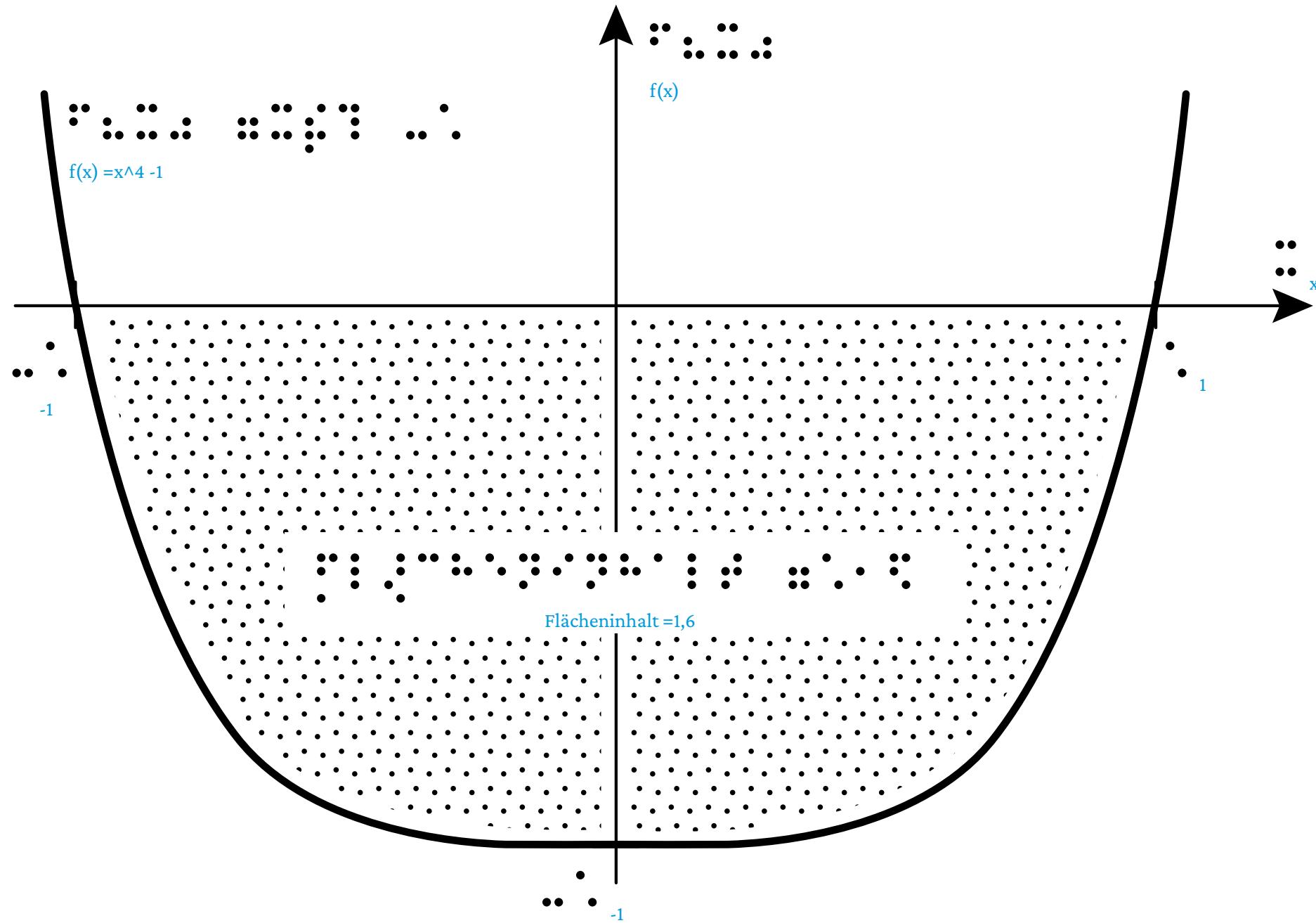
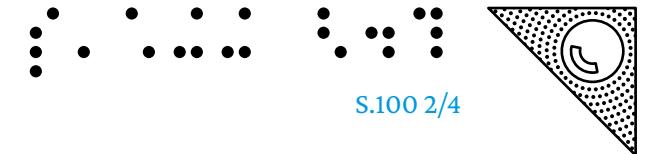
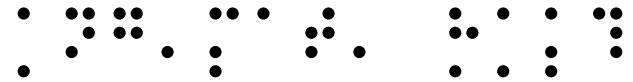
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• • • • • • • • •

S.99 5.07 c

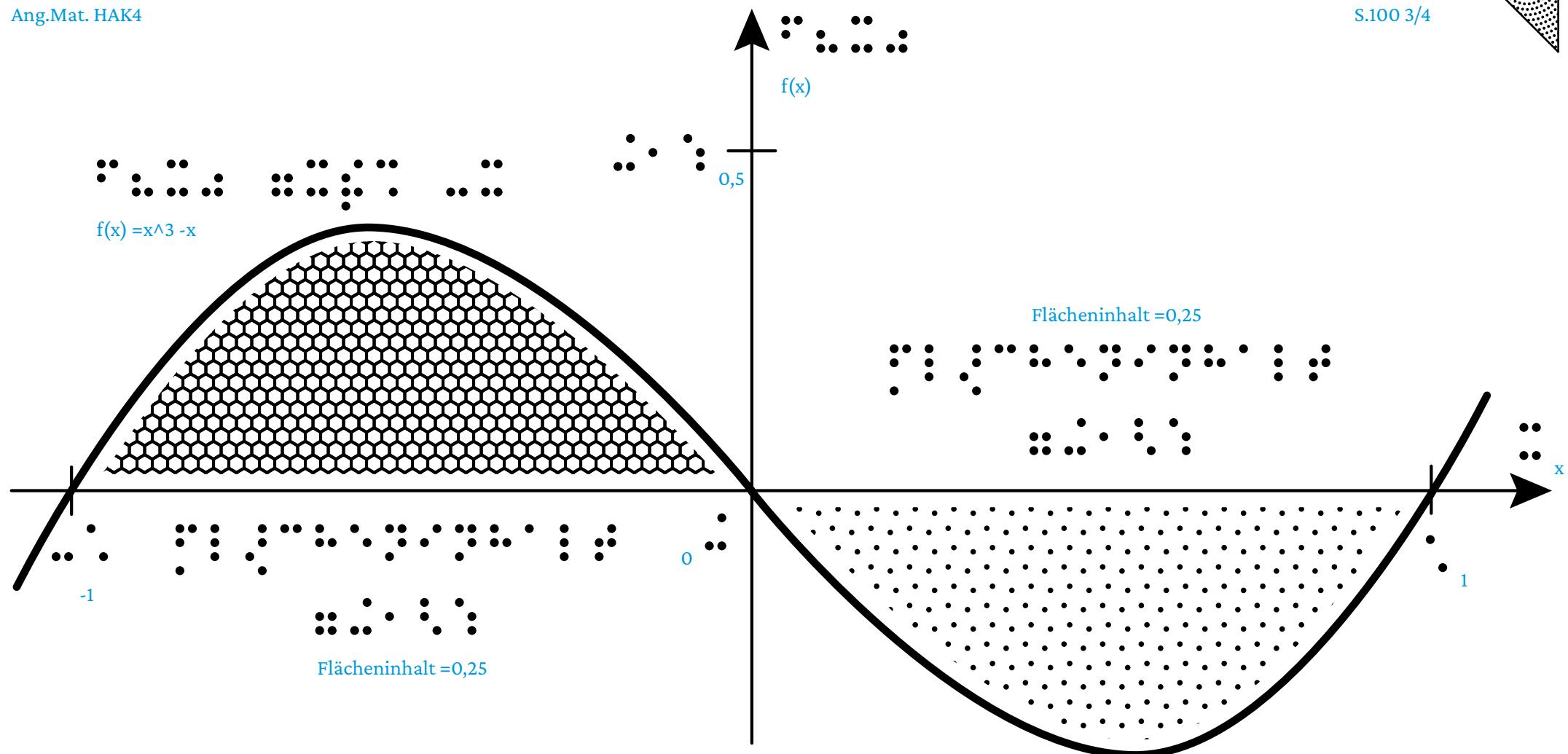
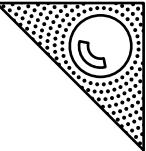






Ang. Mat. HAK4

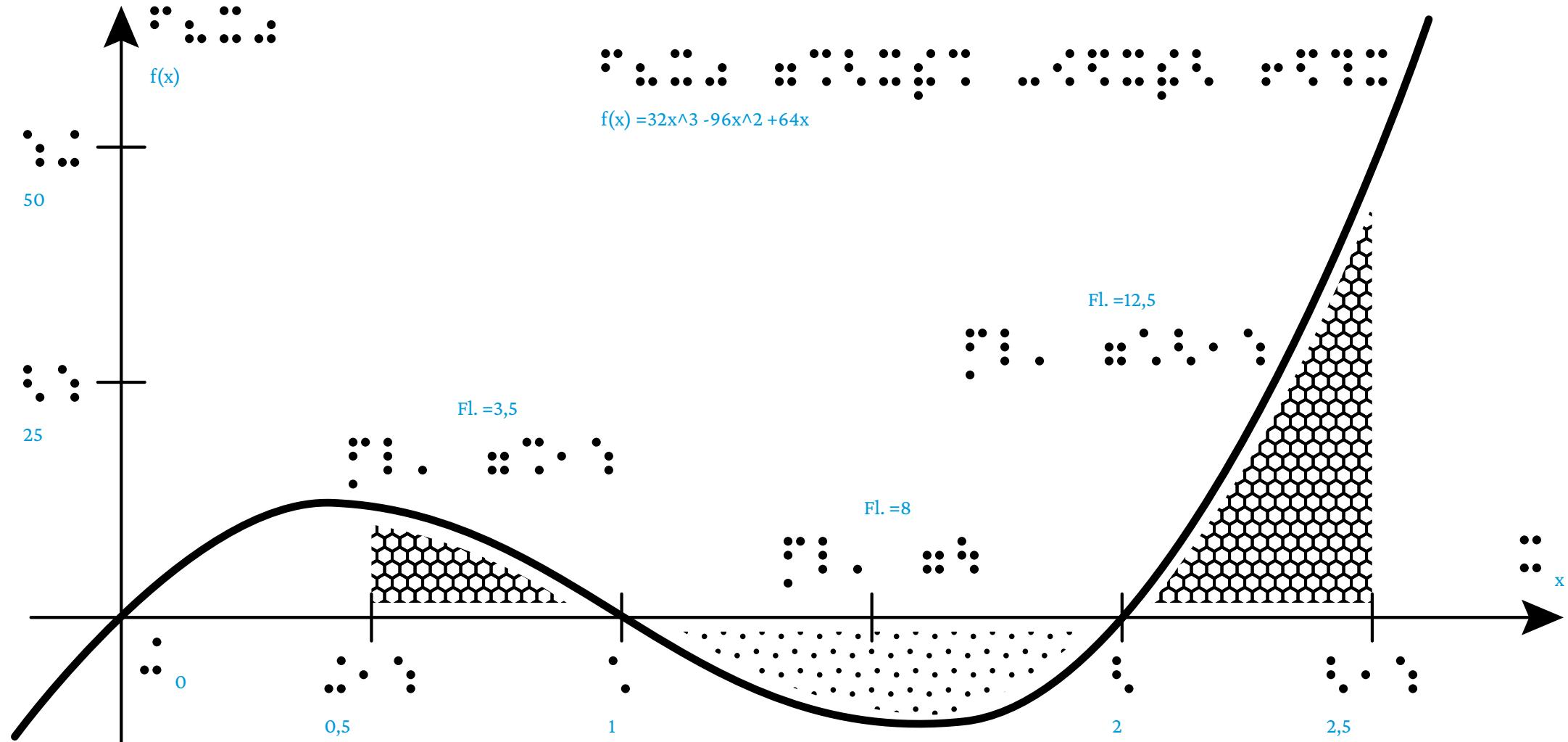
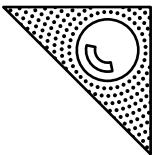
S.100 3/4



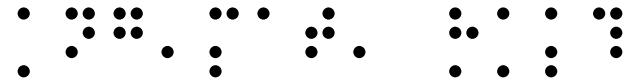
$$\int_{-1}^1 (f(x)) \, dx = 0,25 - 0,25 = 0$$

Ang. Mat. HAK4

S.100 4/4



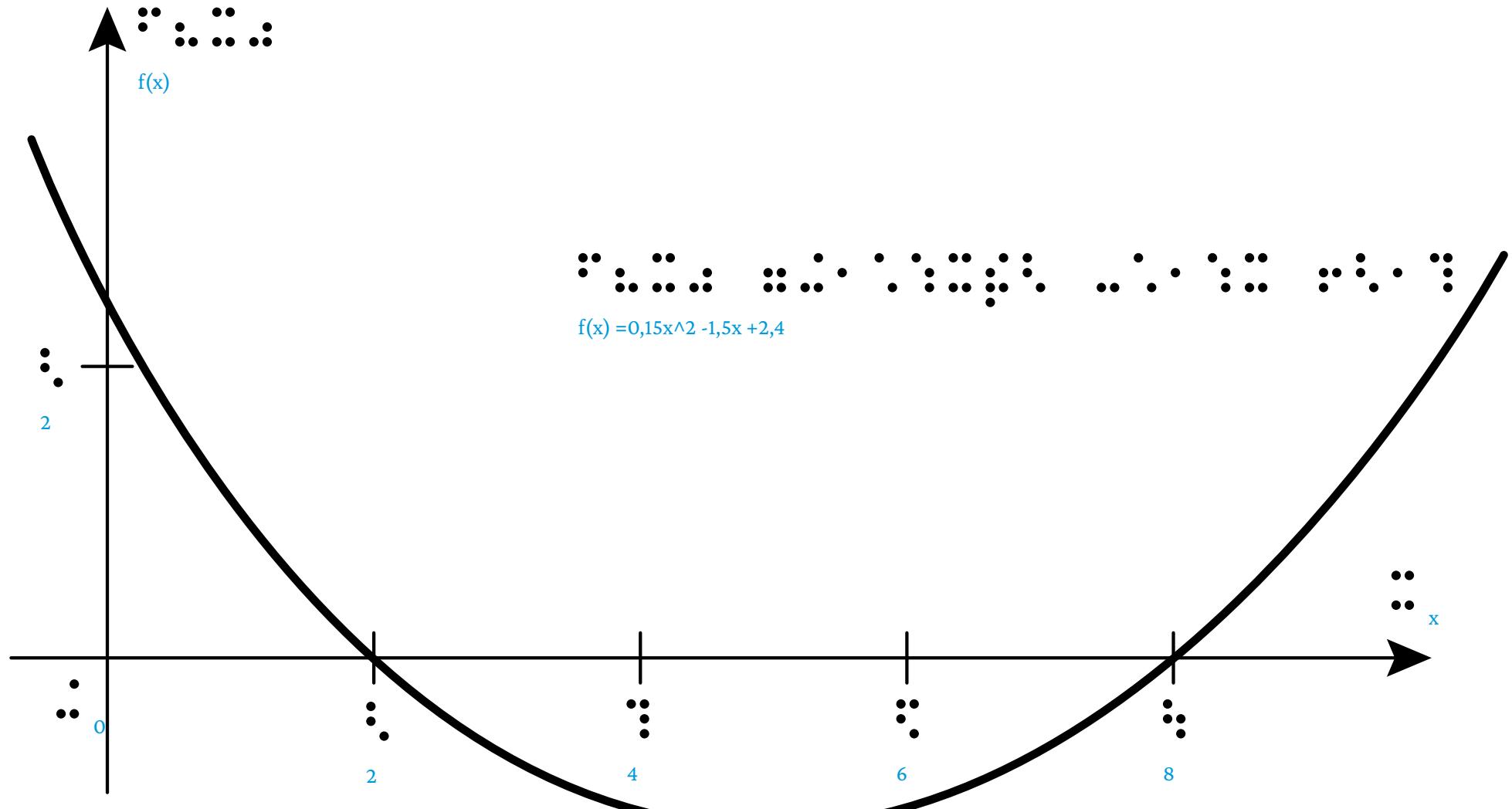
$$\int_{0,5}^{2,5} (f(x)) \, dx = 3,5 - 8 + 12,5 = 8$$

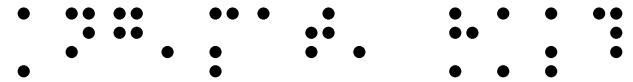


Ang. Mat. HAK4



S.100 5.09

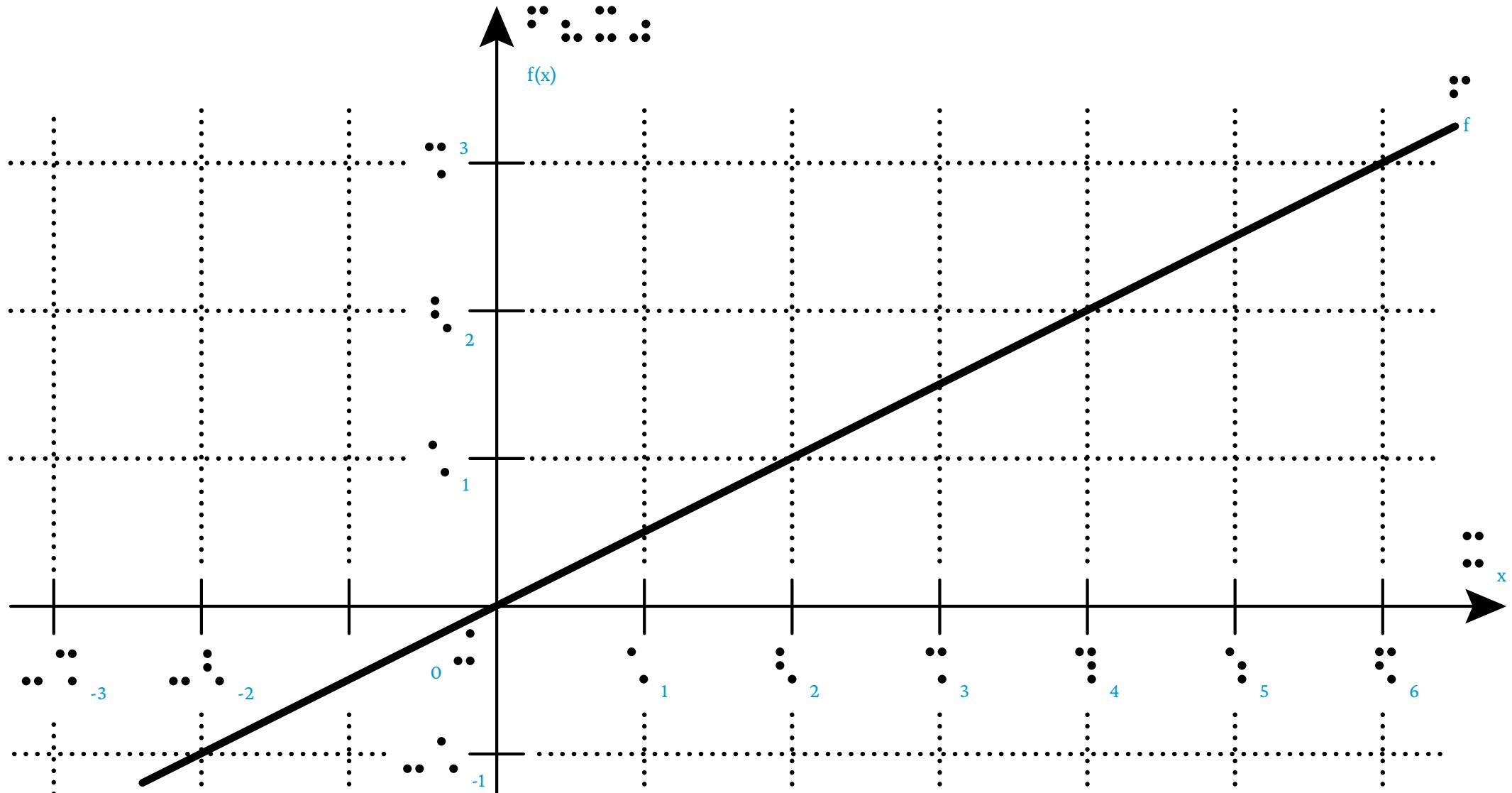


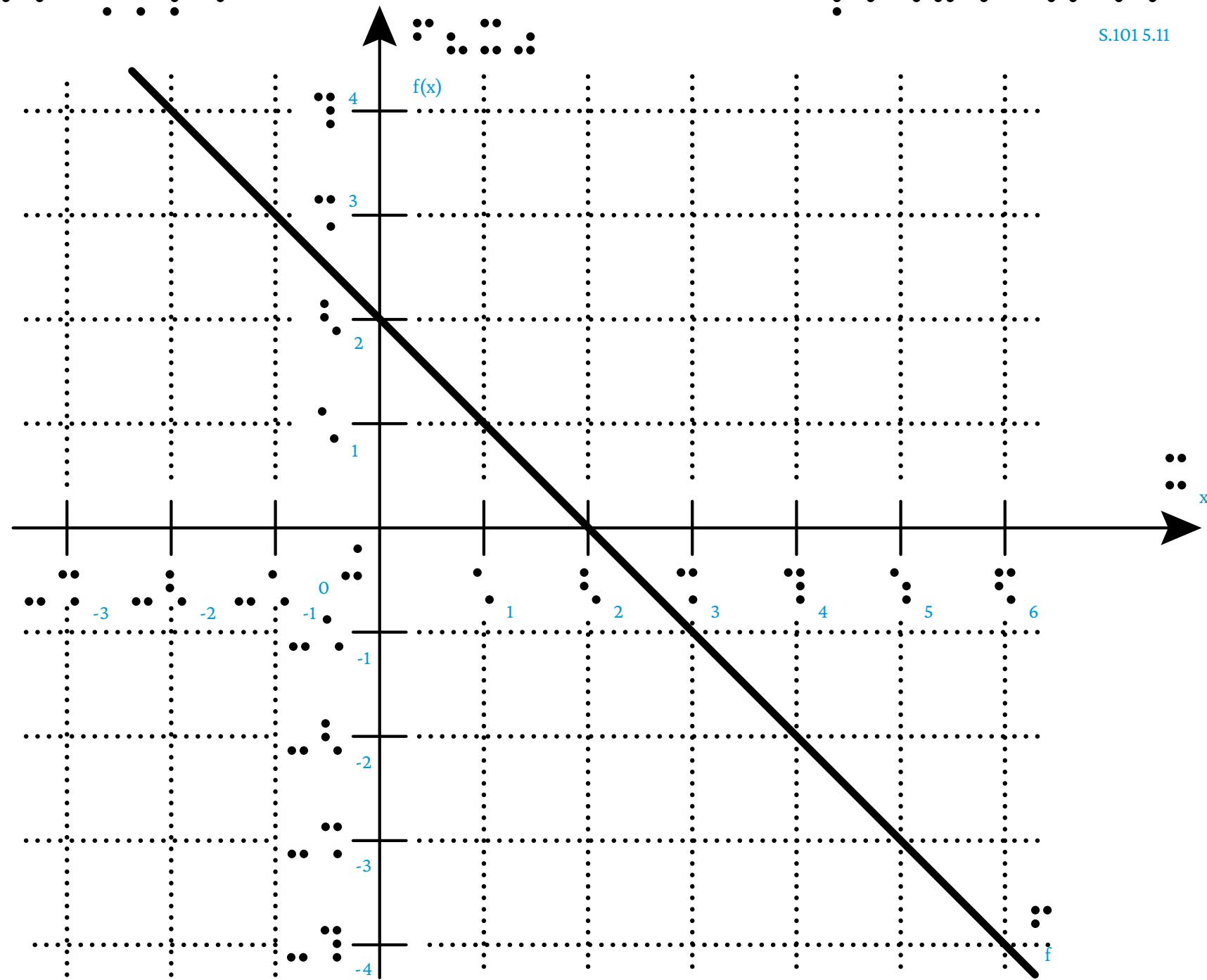
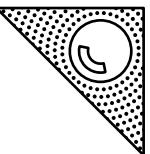
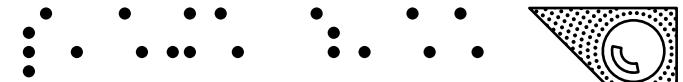
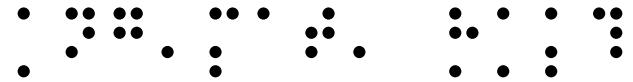


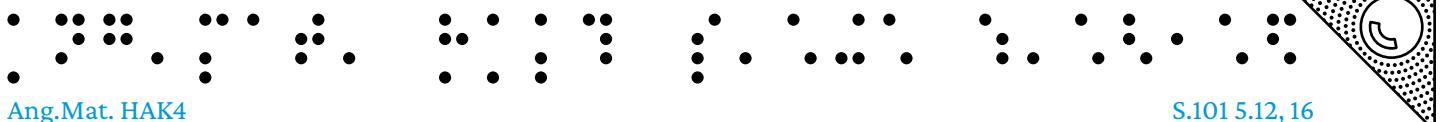
Ang. Mat. HAK4



S.101 5.10

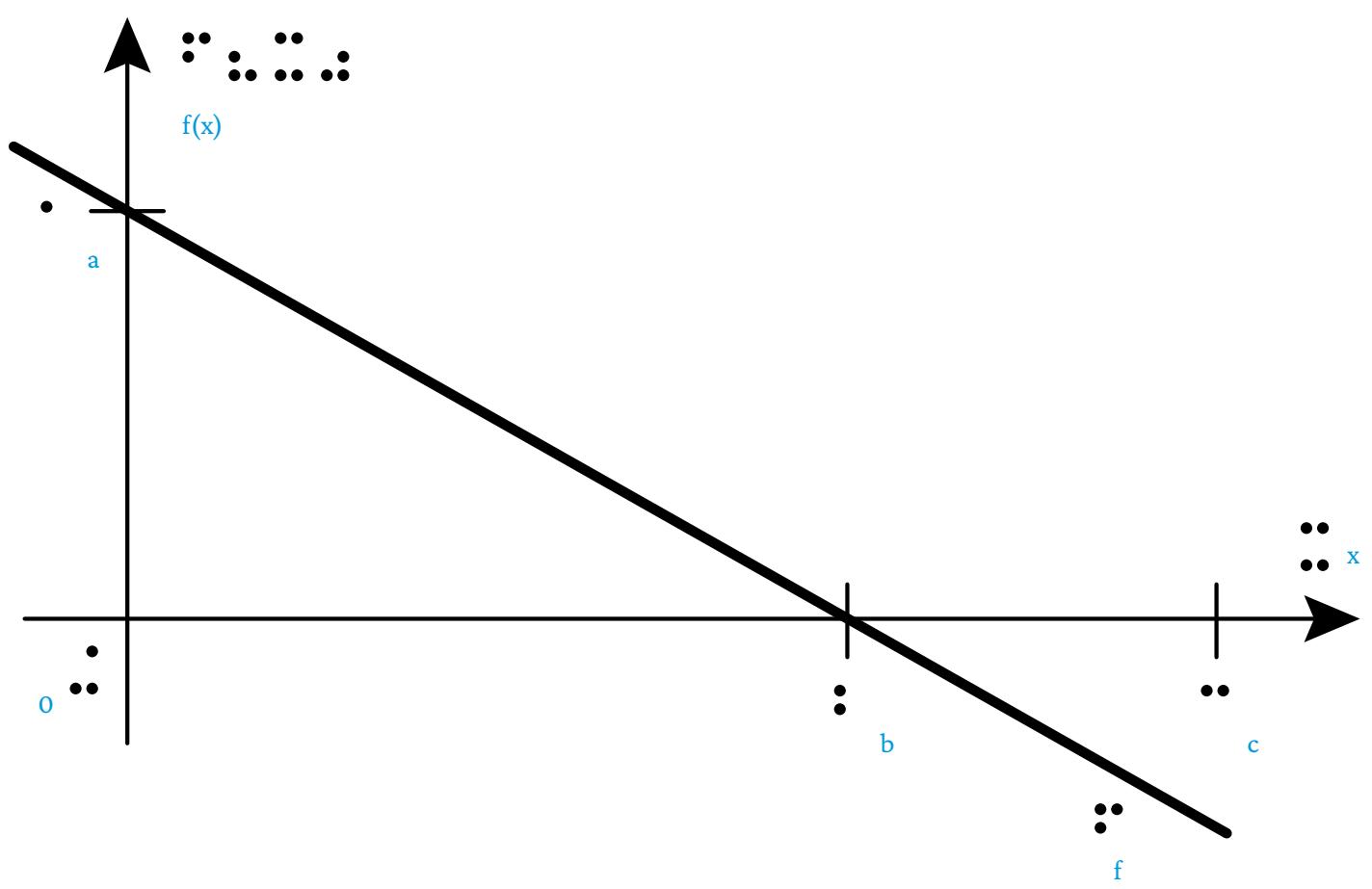
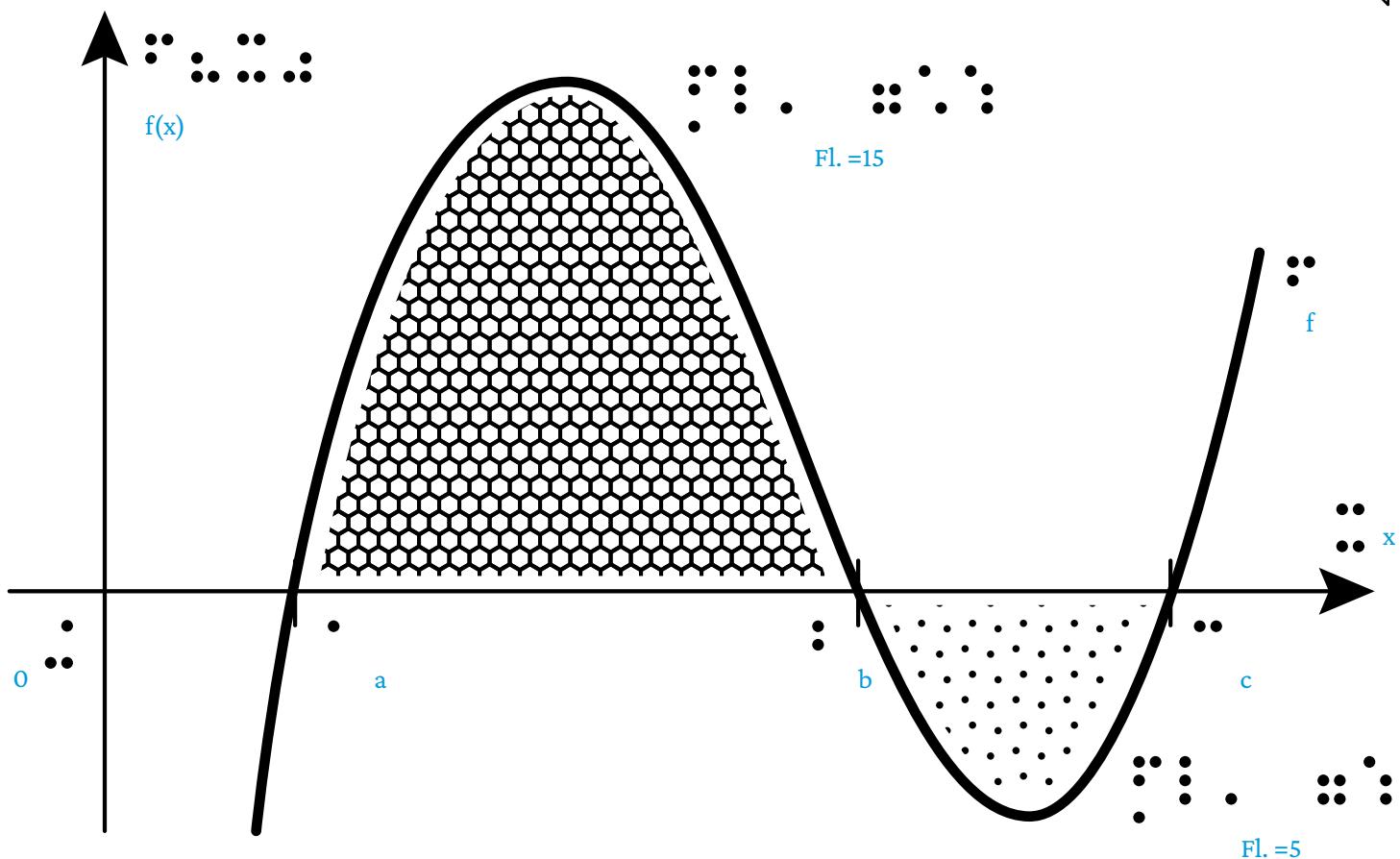


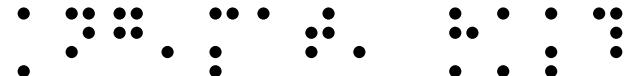




Ang. Mat. HAK4

S.101 5.12, 16

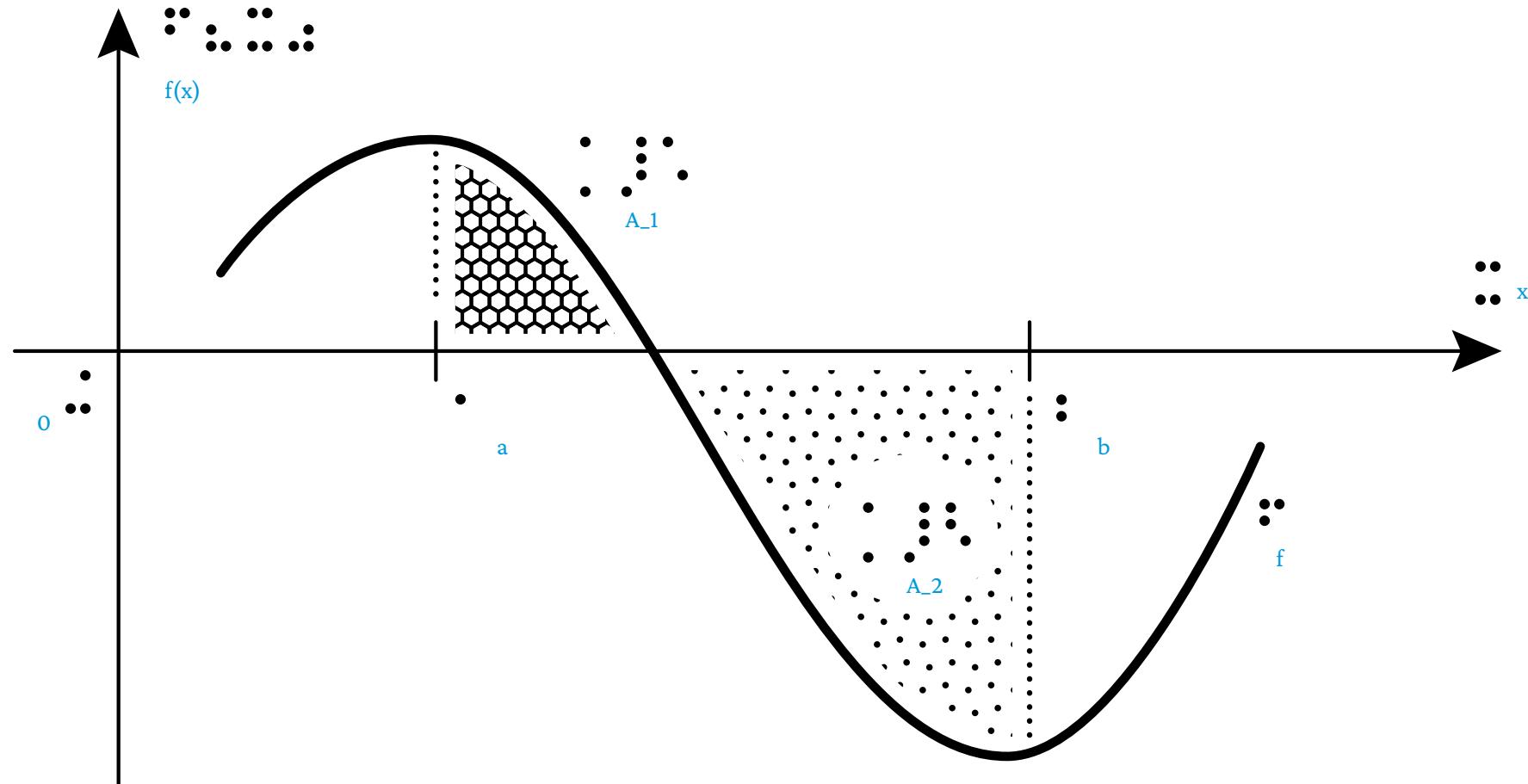




Ang. Mat. HAK4

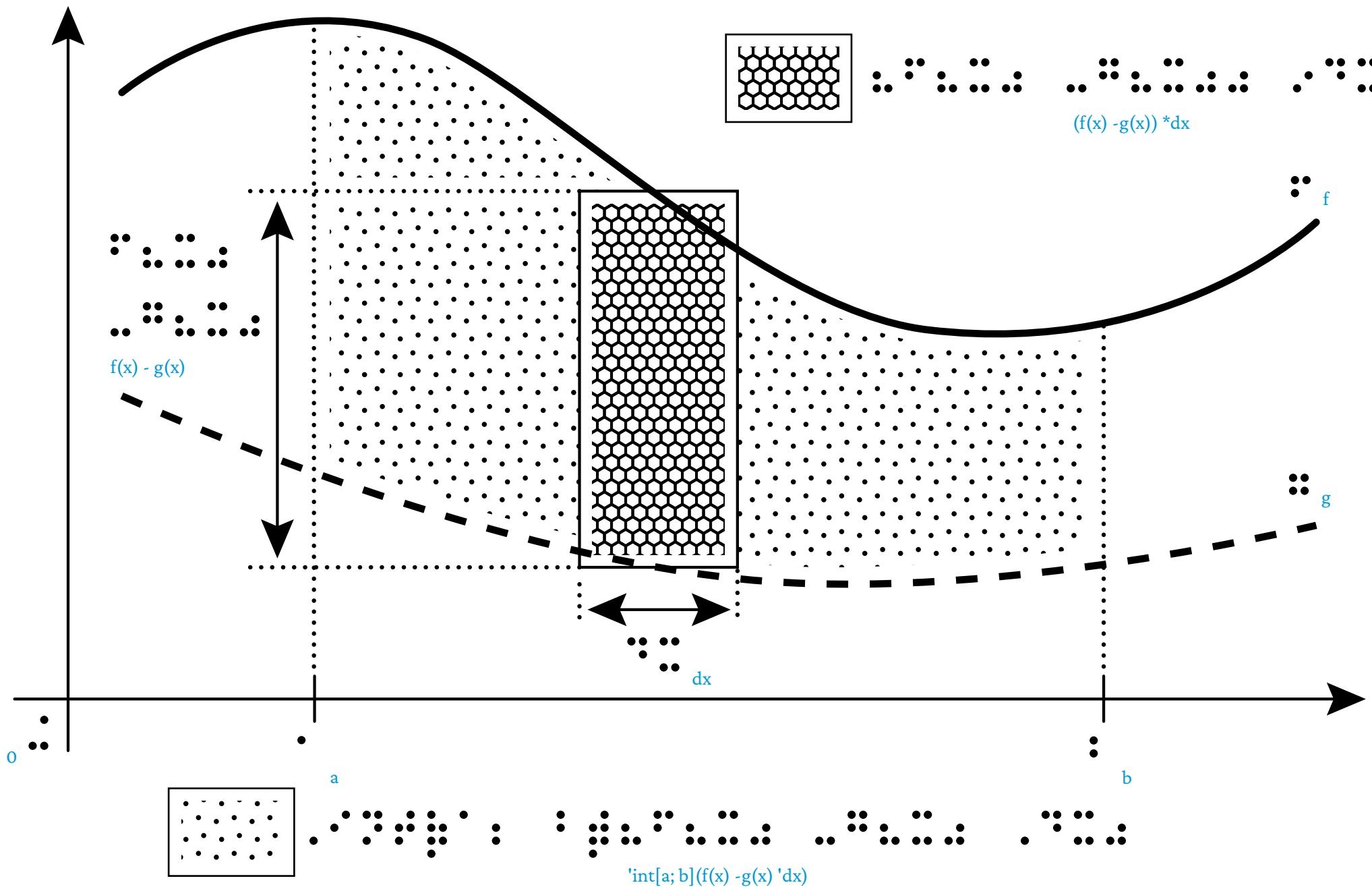


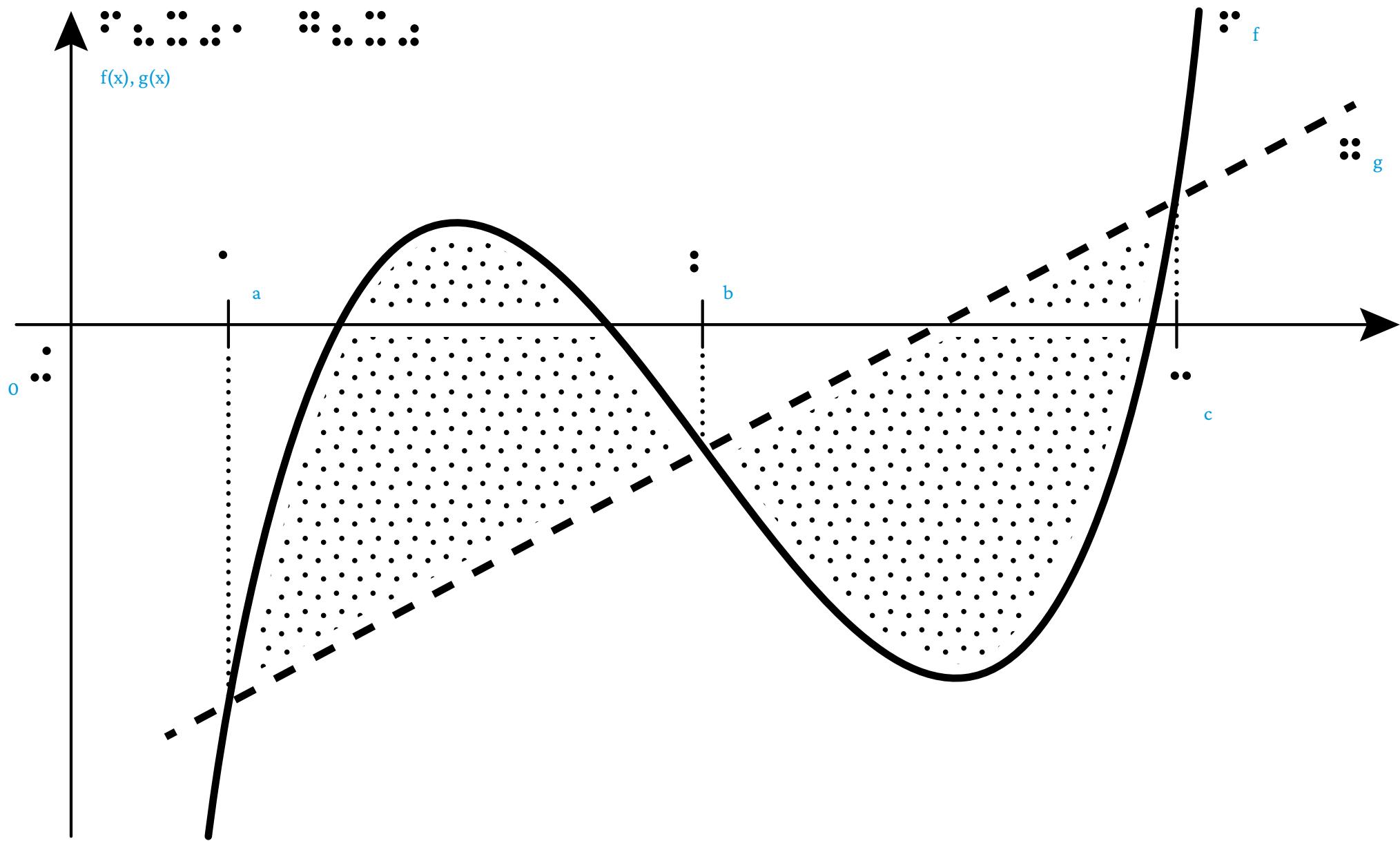
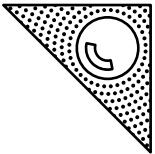
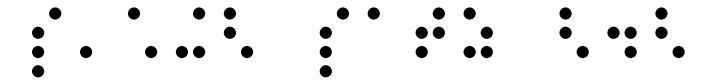
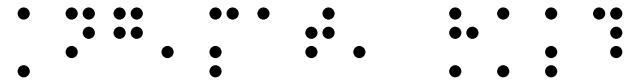
S.101 5.17

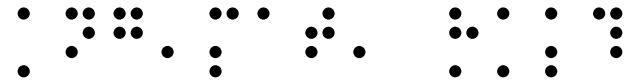


Ang. Mat. HAK4

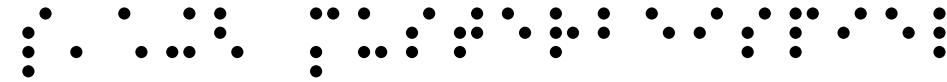
S.102 Satz 1/2



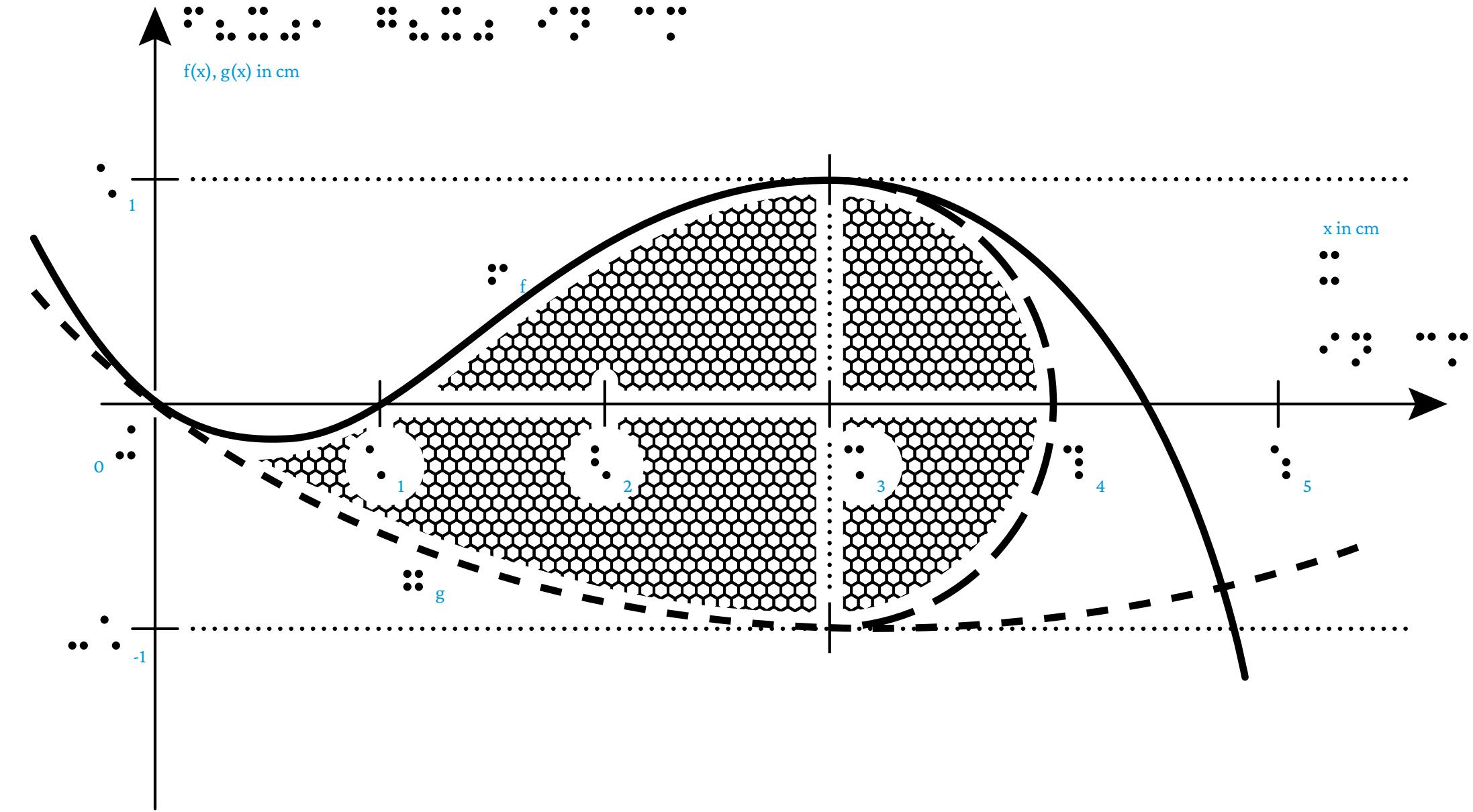
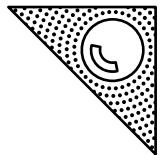


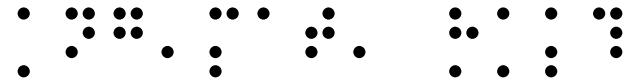


Ang. Mat. HAK4



S.102 Musterbeispiel

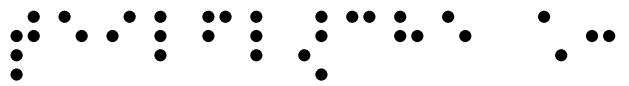




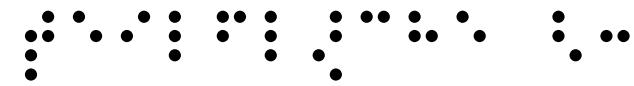
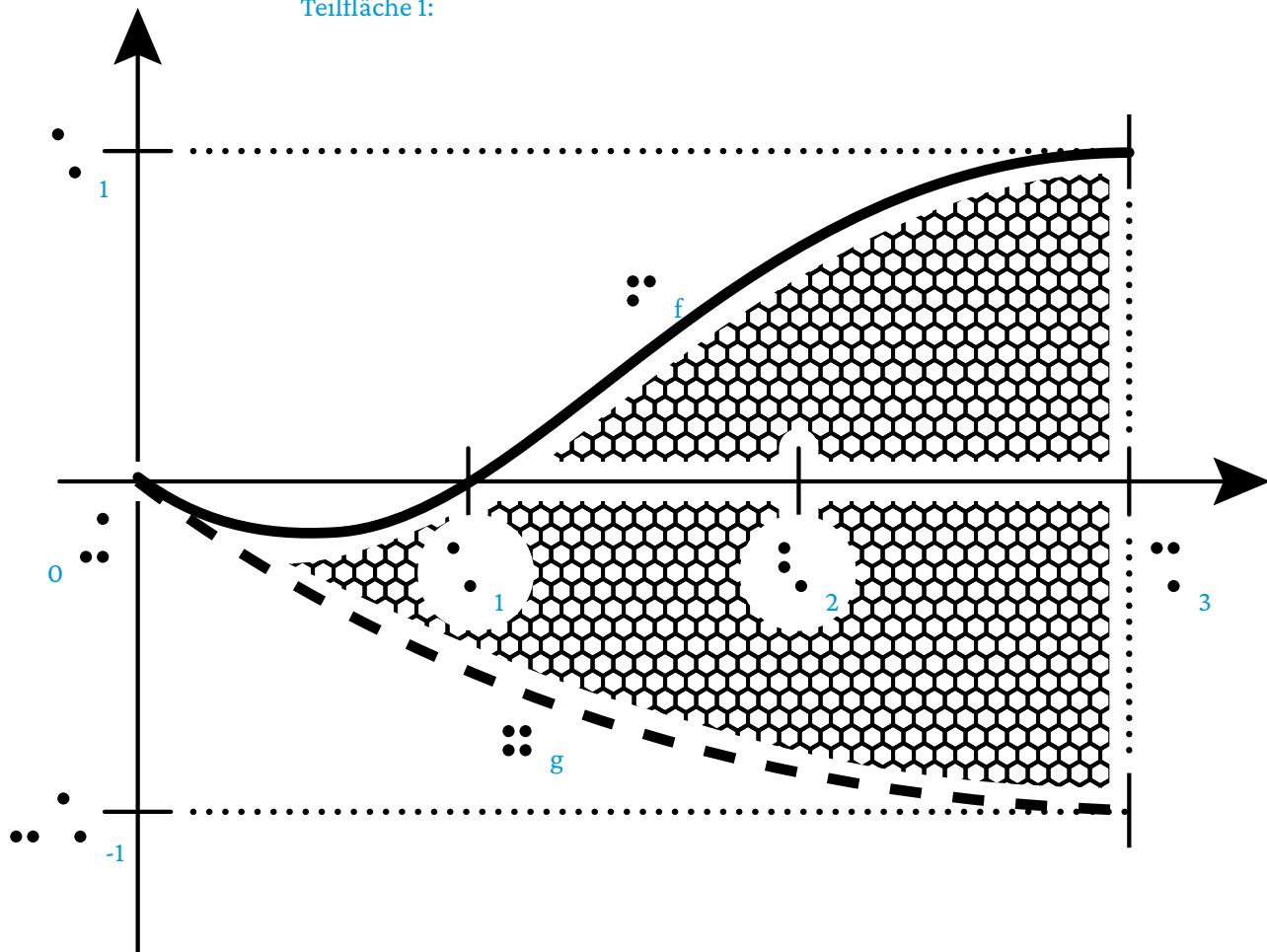
Ang. Mat. HAK4



S.102 Lösung

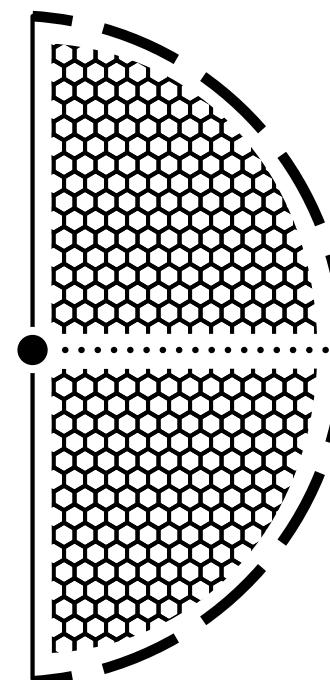


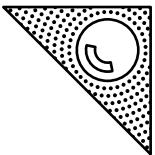
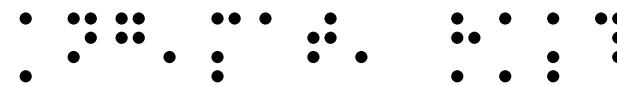
Teilfläche 1:



Teilfläche 2:

$r = 1 \text{ cm}$

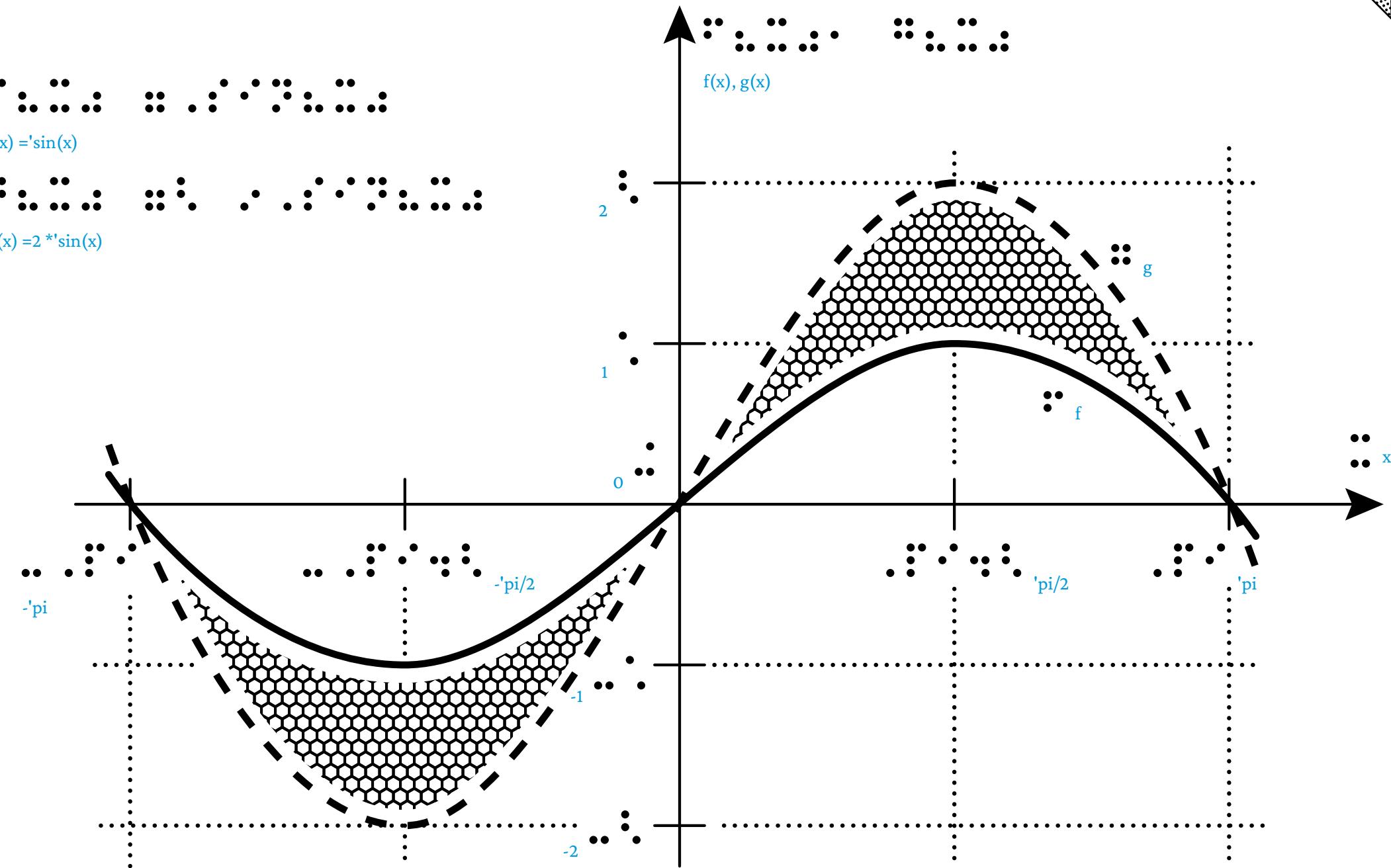


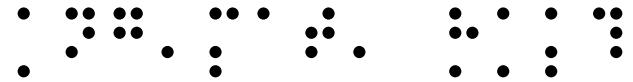


The image shows a horizontal sequence of Braille characters. The first character consists of two vertical columns of dots, representing the letter 'H'. This is followed by a space, then three more characters, each consisting of two vertical columns of dots, representing the letters 'E', 'L', and 'L' respectively. The entire sequence is rendered in a light gray color against a white background.

$$f(x) = \sin(x)$$

$$g(x) = 2 * \sin(x)$$

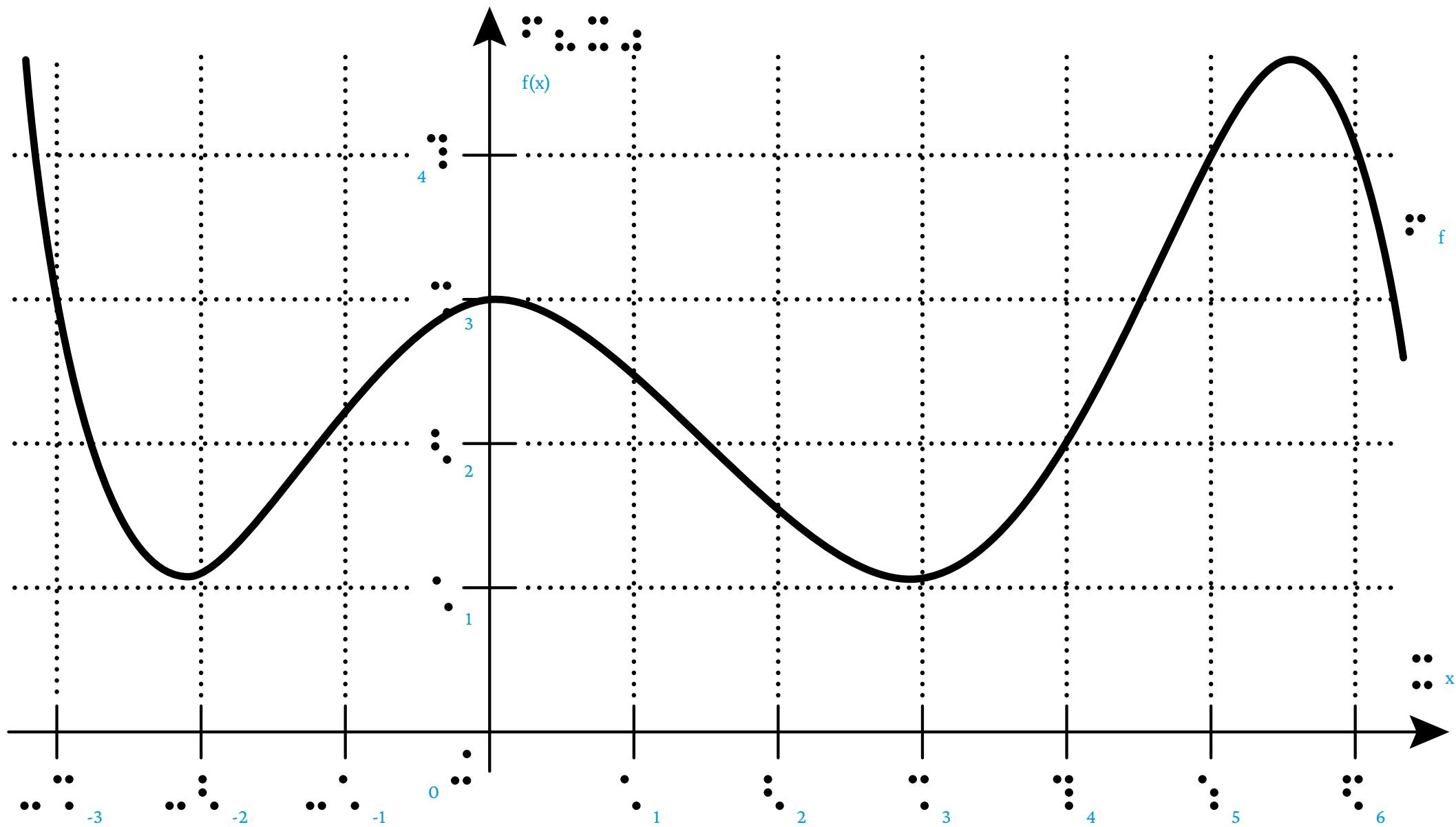




Ang. Mat. HAK4

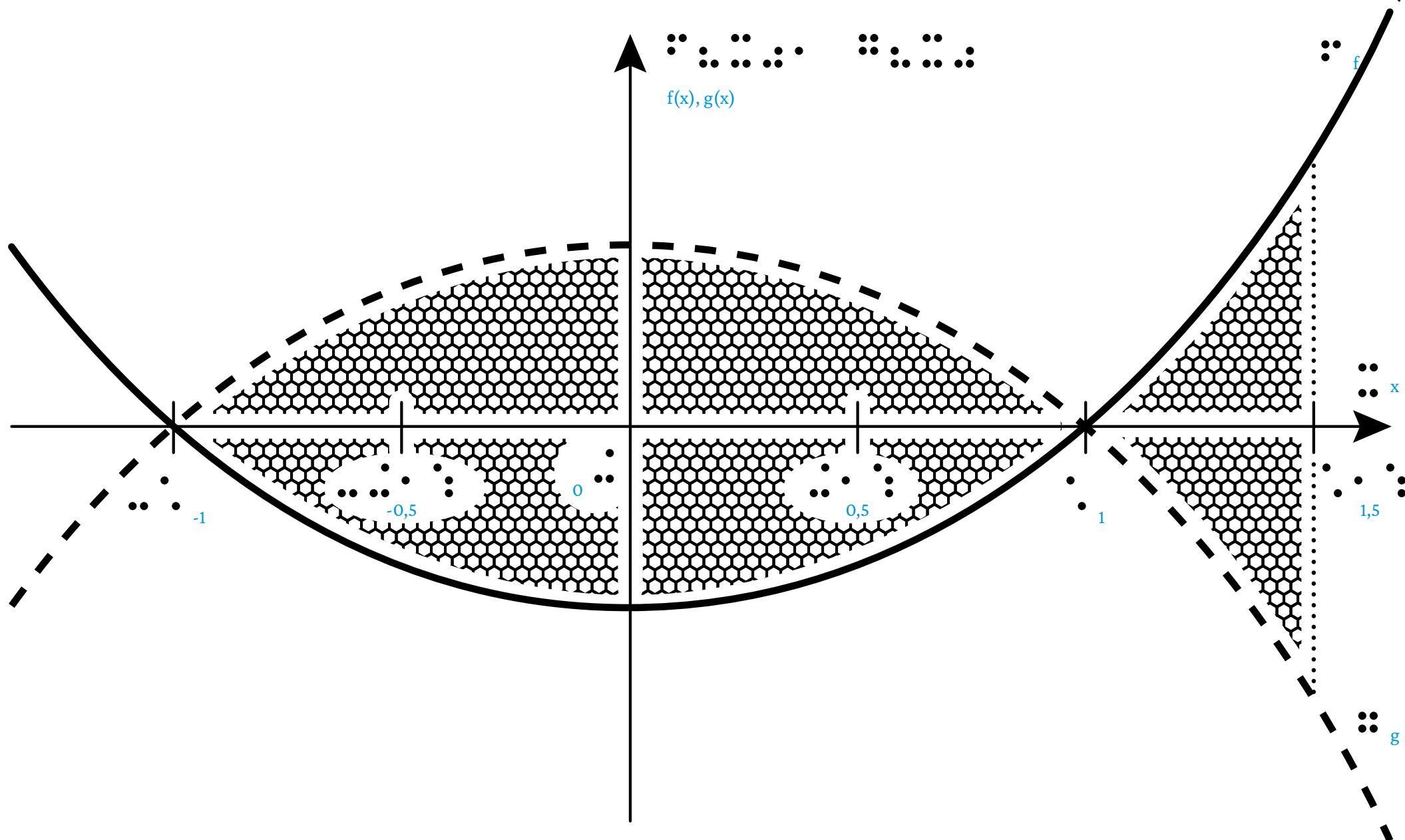


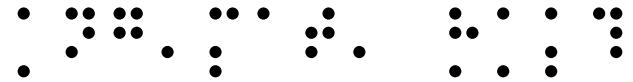
S.103 5.22



Ang. Mat. HAK4

S.103 5.23

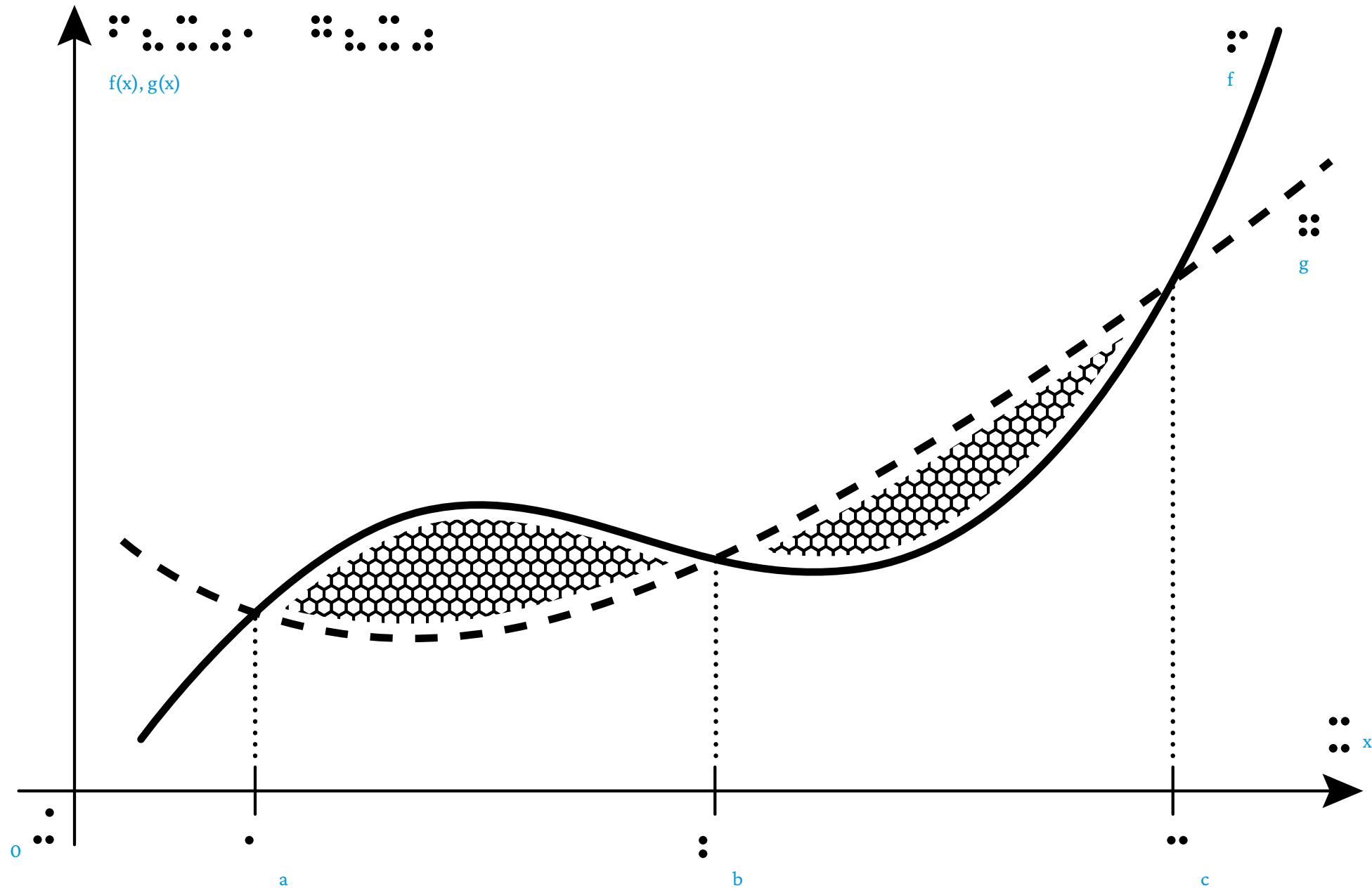


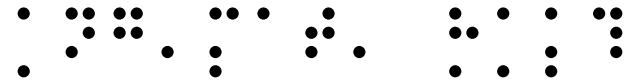


Ang. Mat. HAK4

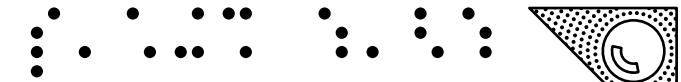


S.103 5.24

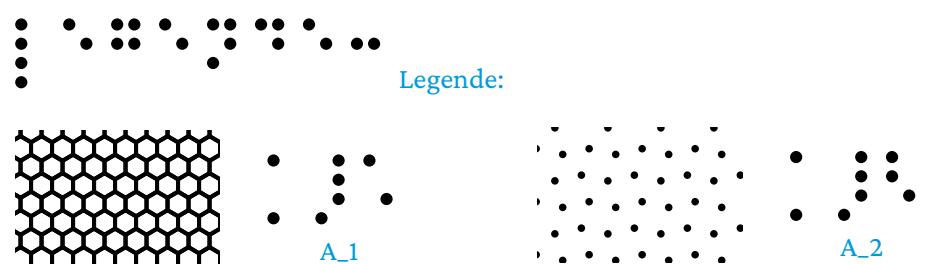
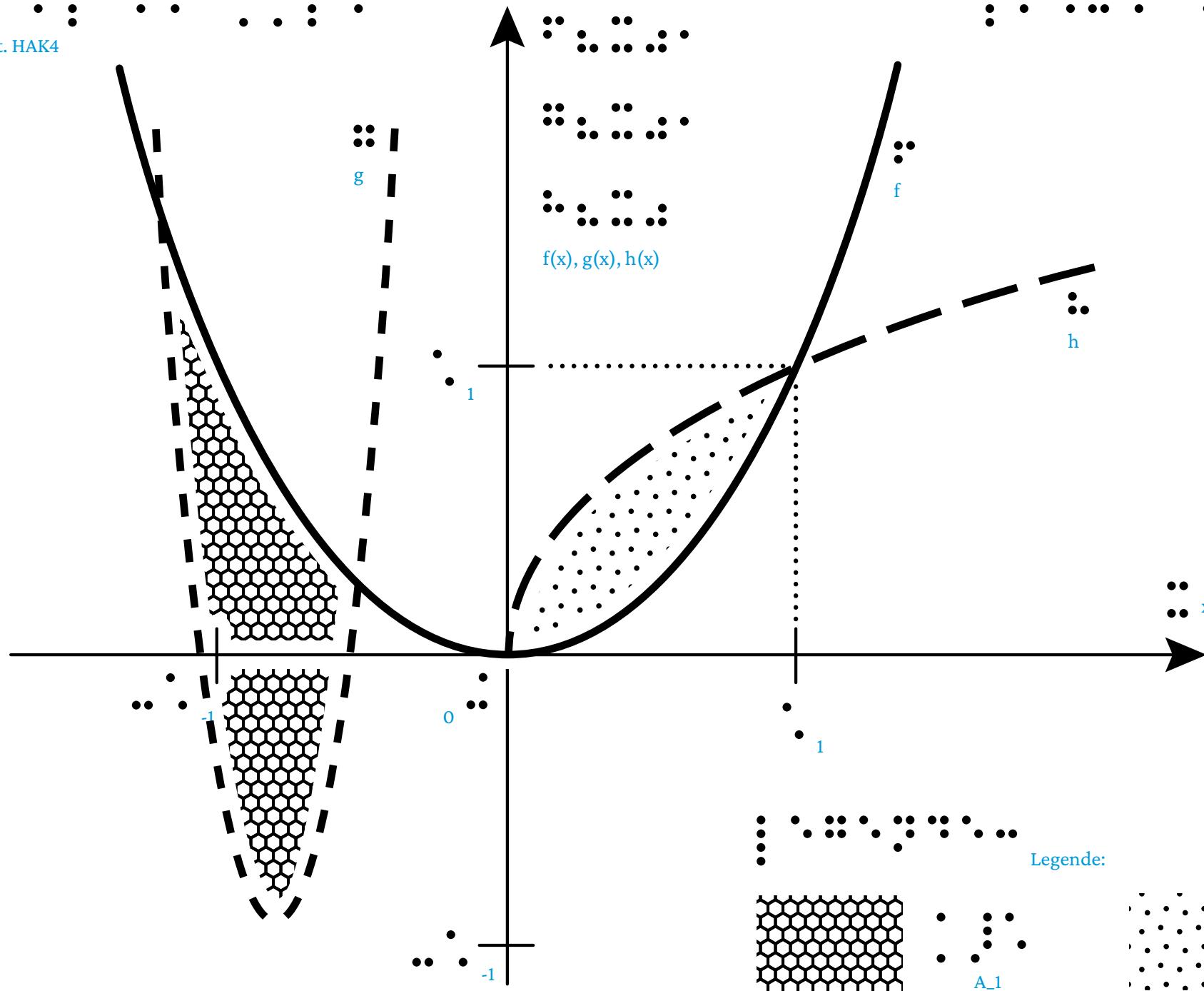
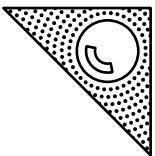


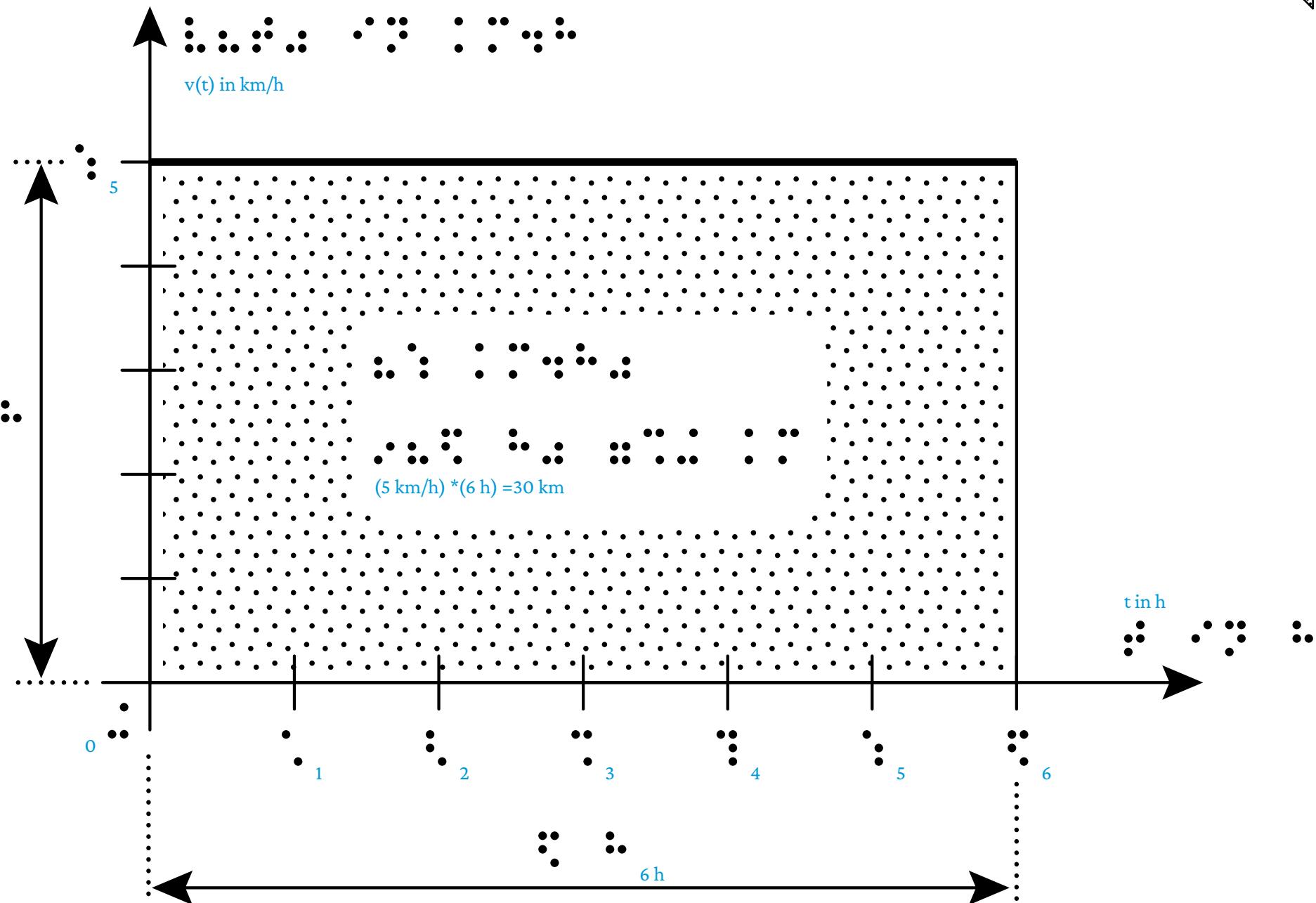
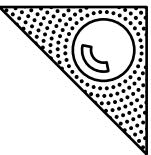
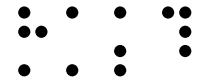
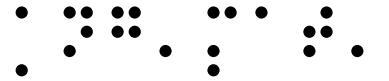


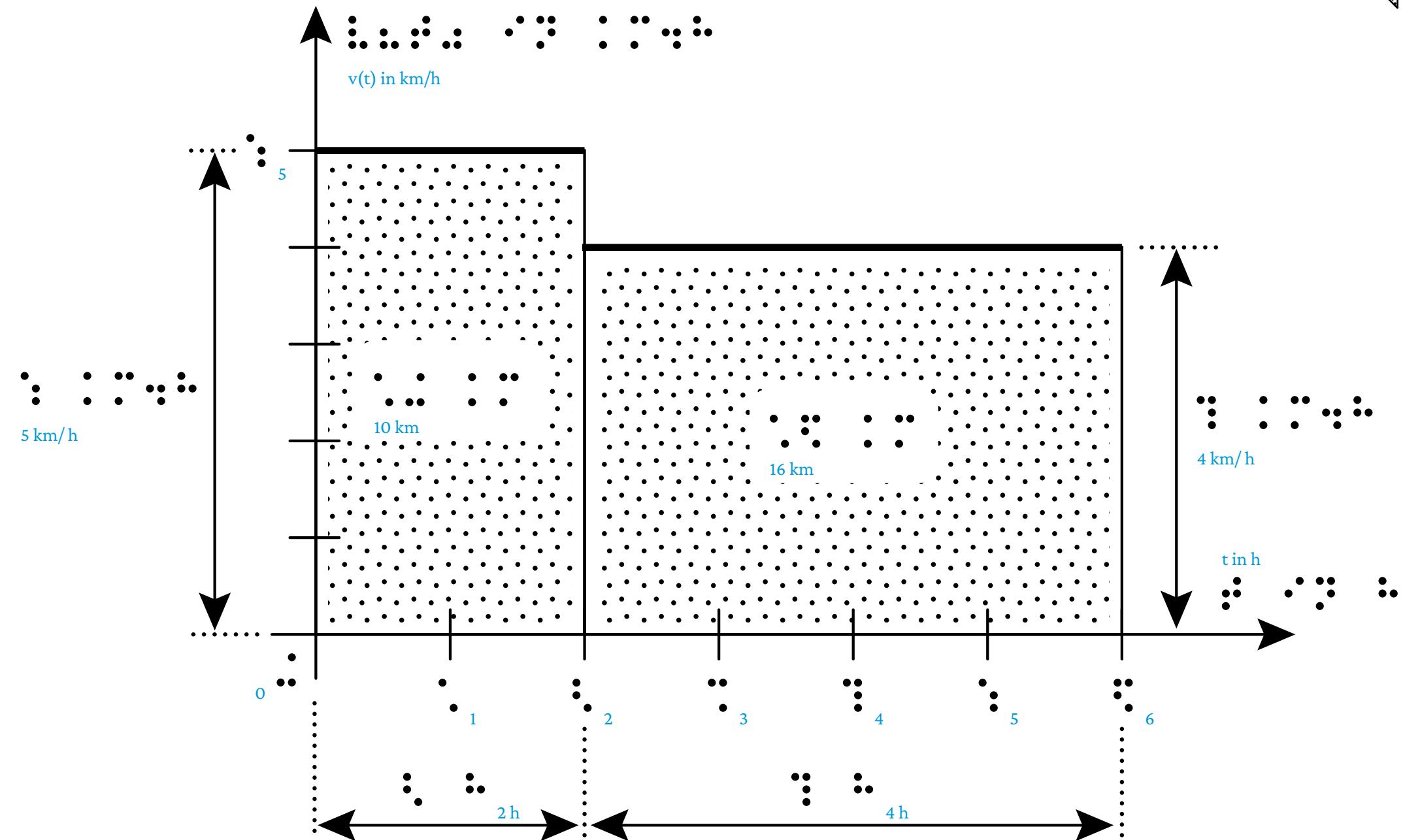
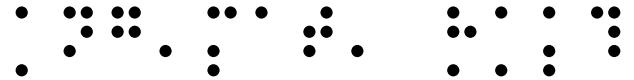
Ang. Mat. HAK4

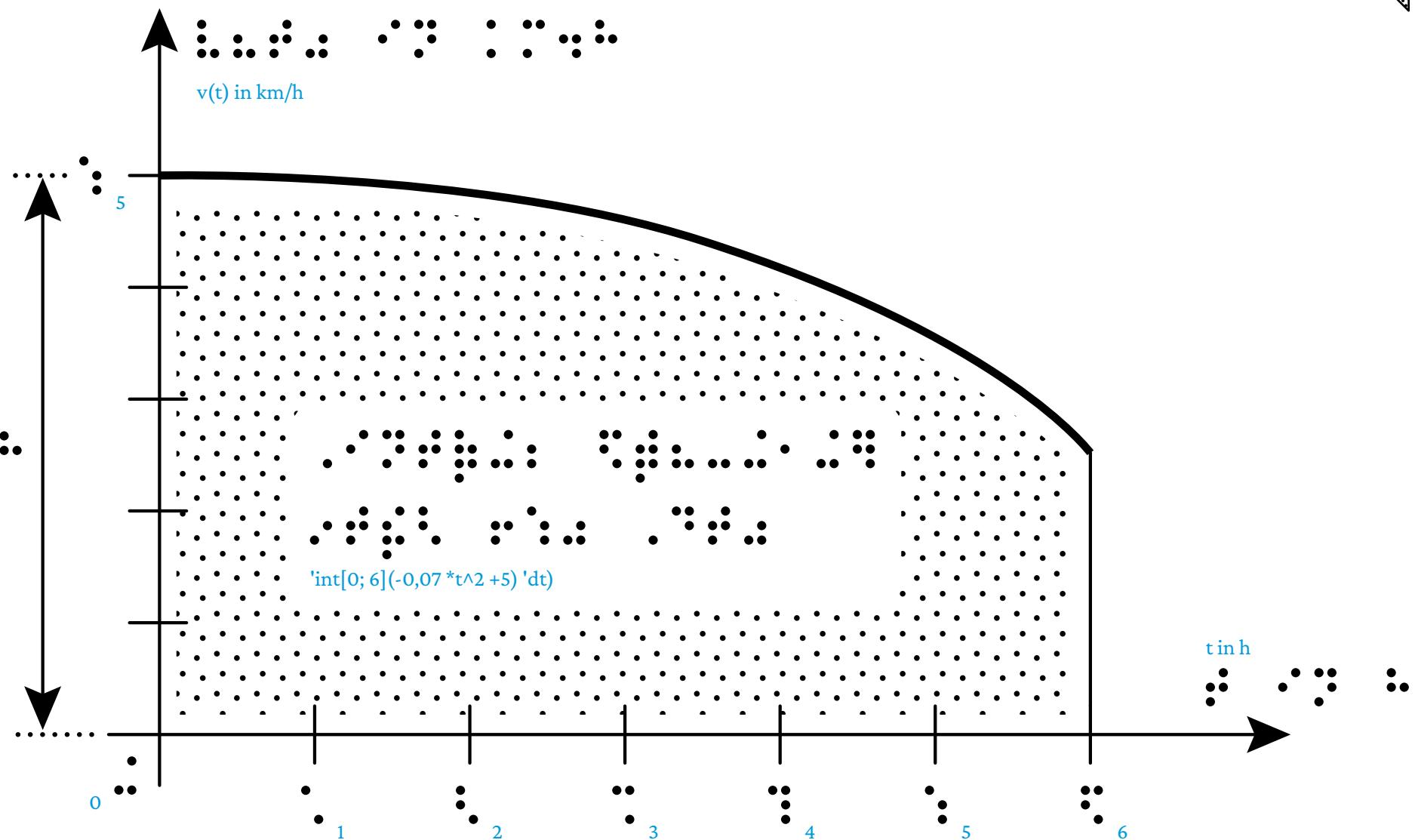
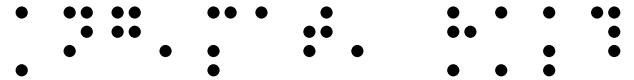


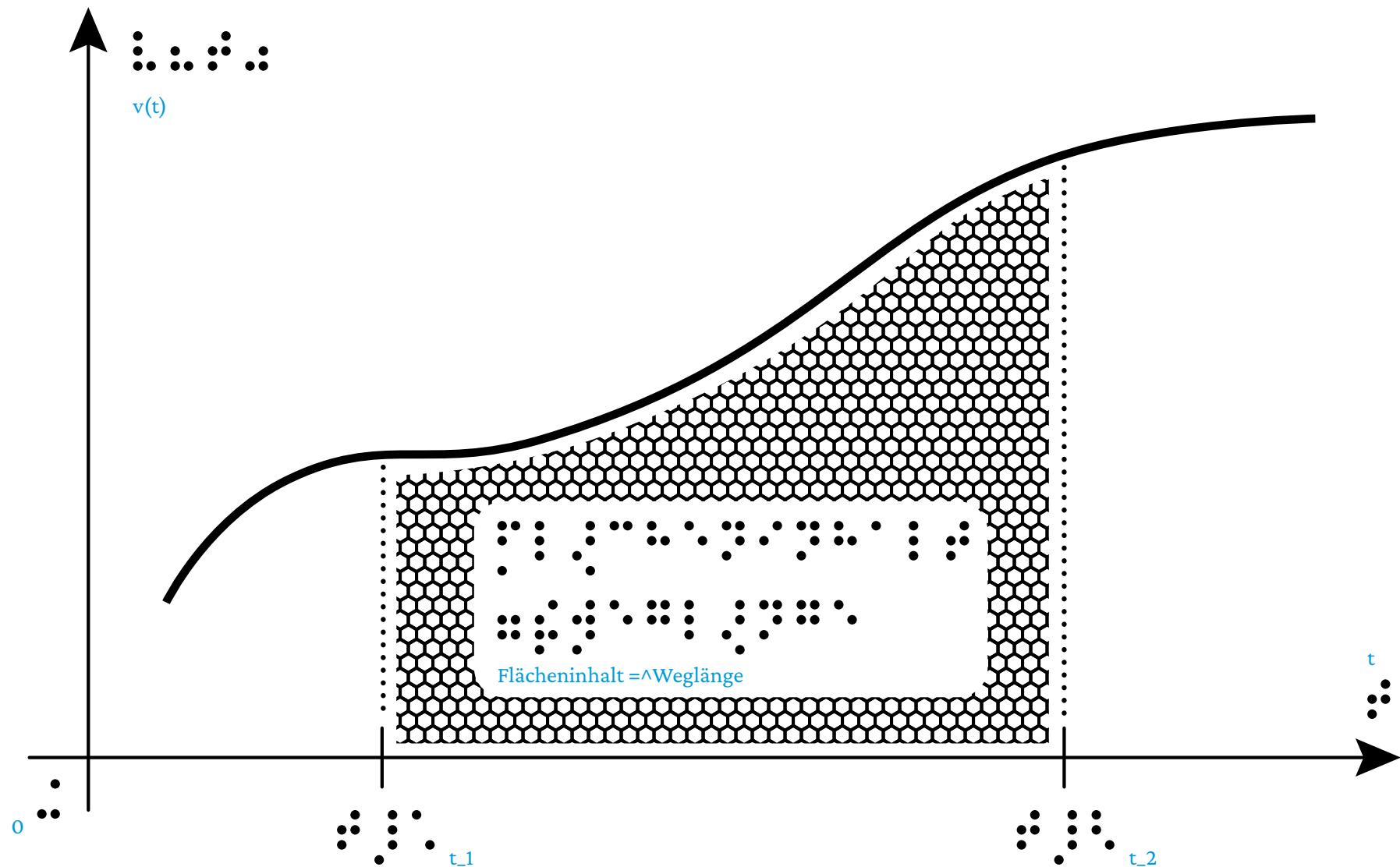
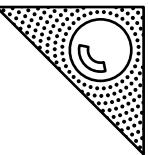
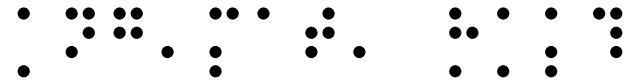
S.103 5.25





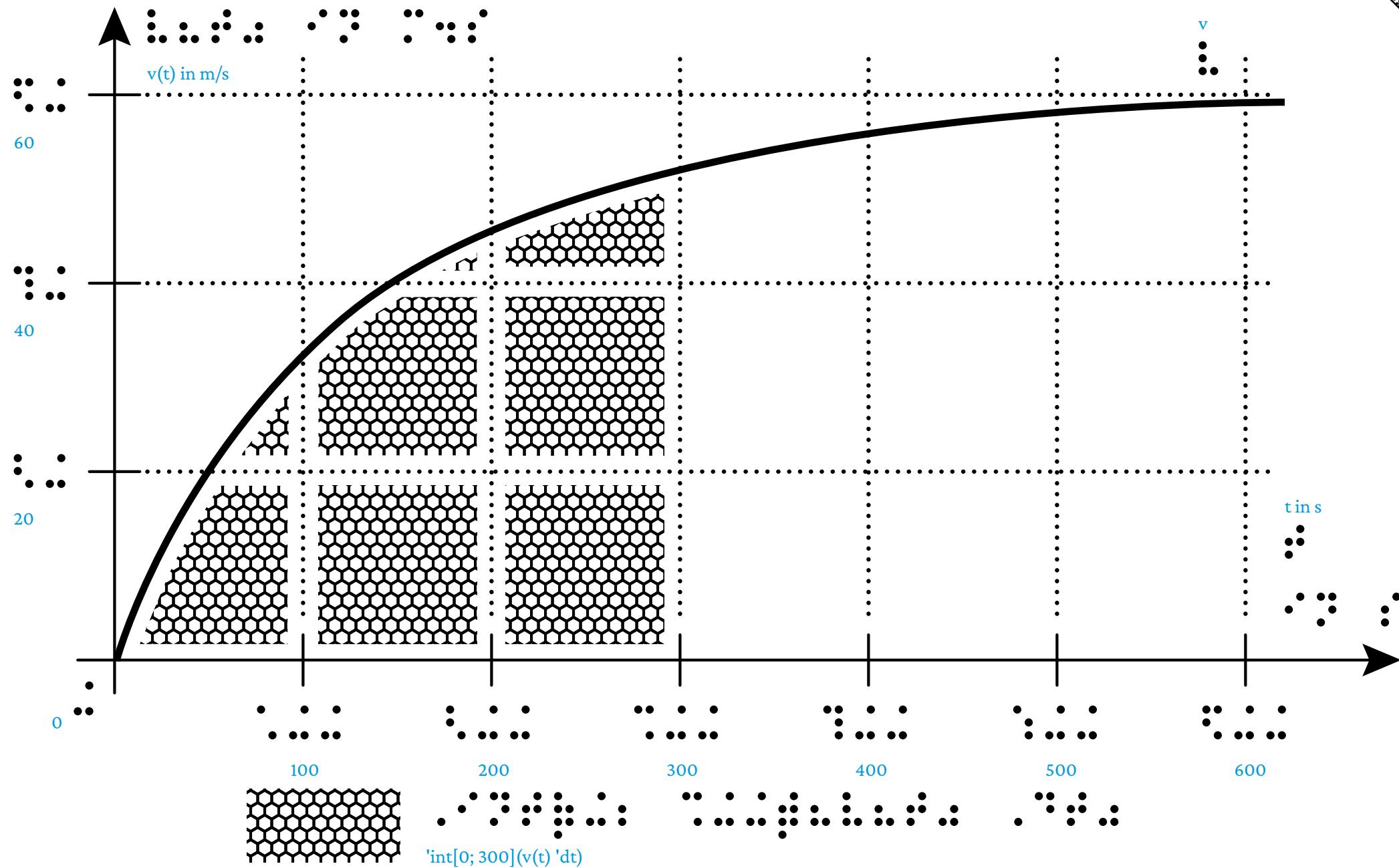
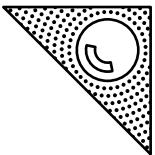


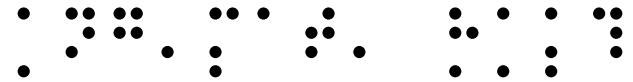




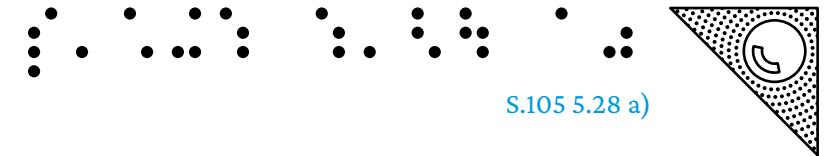
Ang. Mat. HAK4

S.104 Musterbeispiel

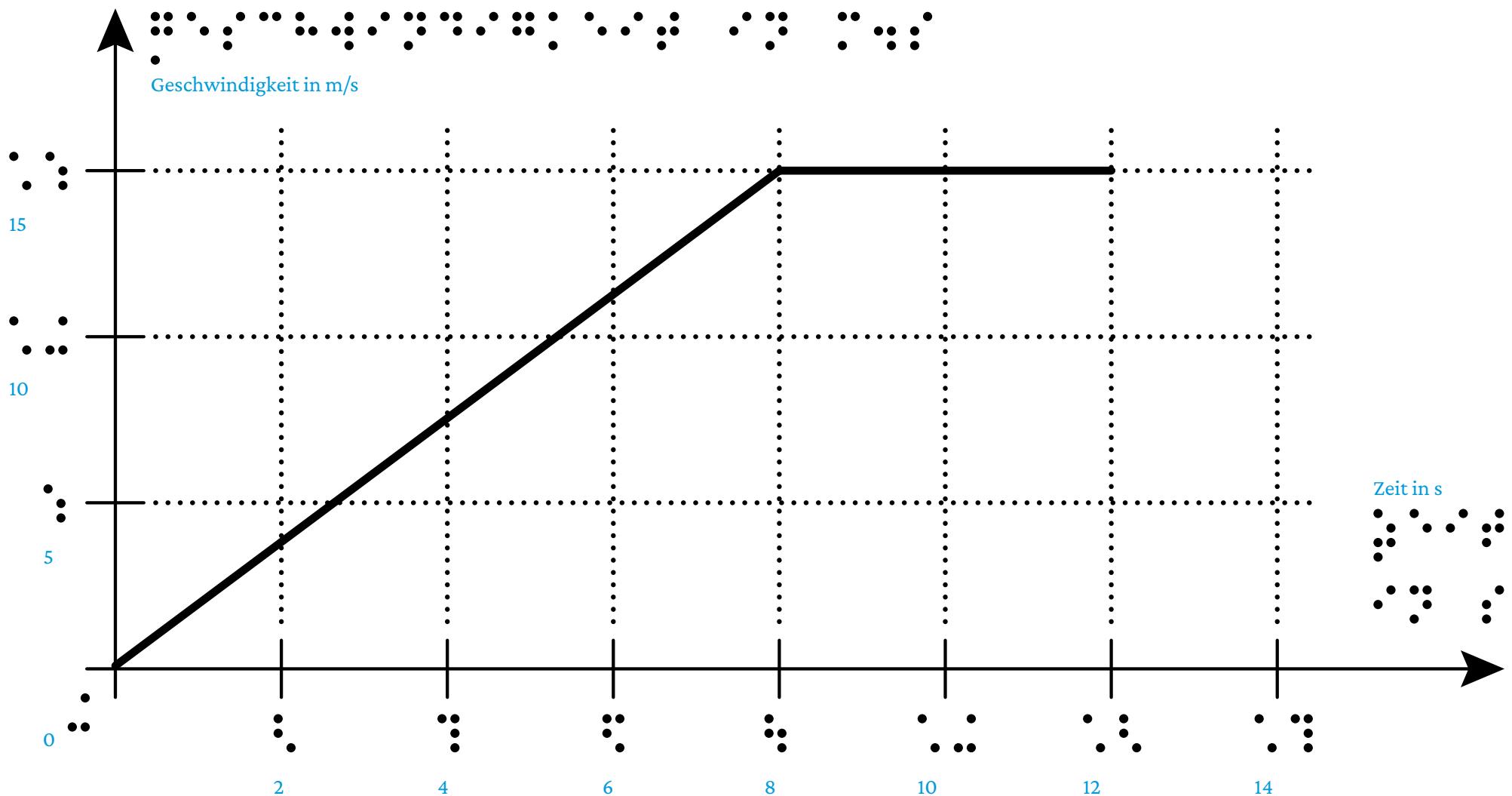
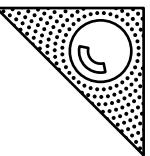


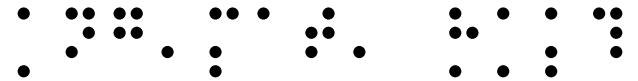


Ang. Mat. HAK4

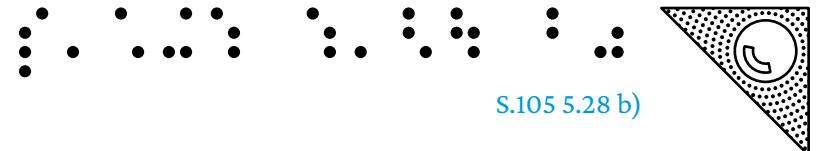


S.105 5.28 a)

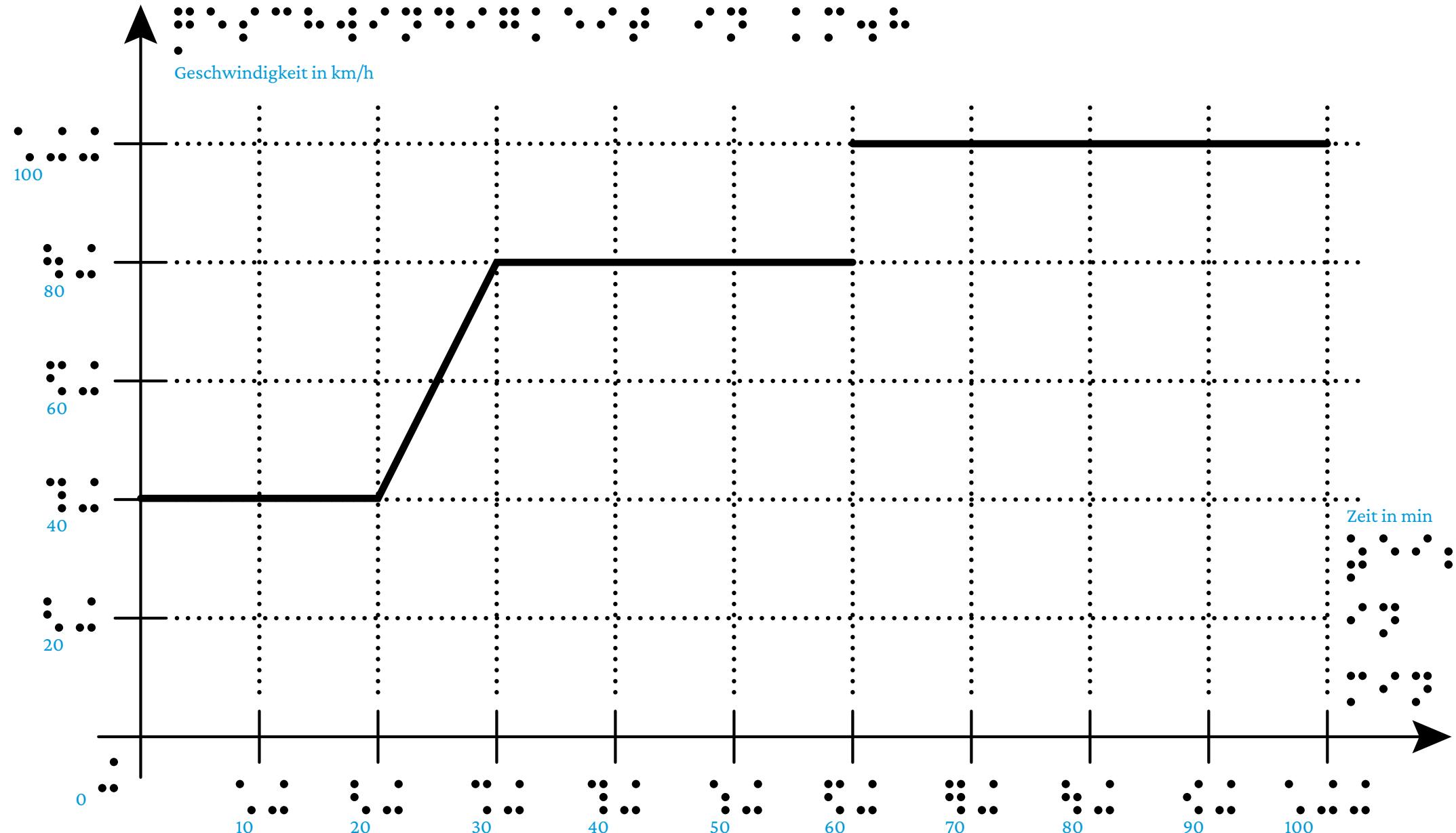




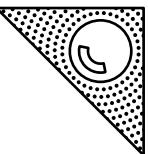
Ang.Mat. HAK4



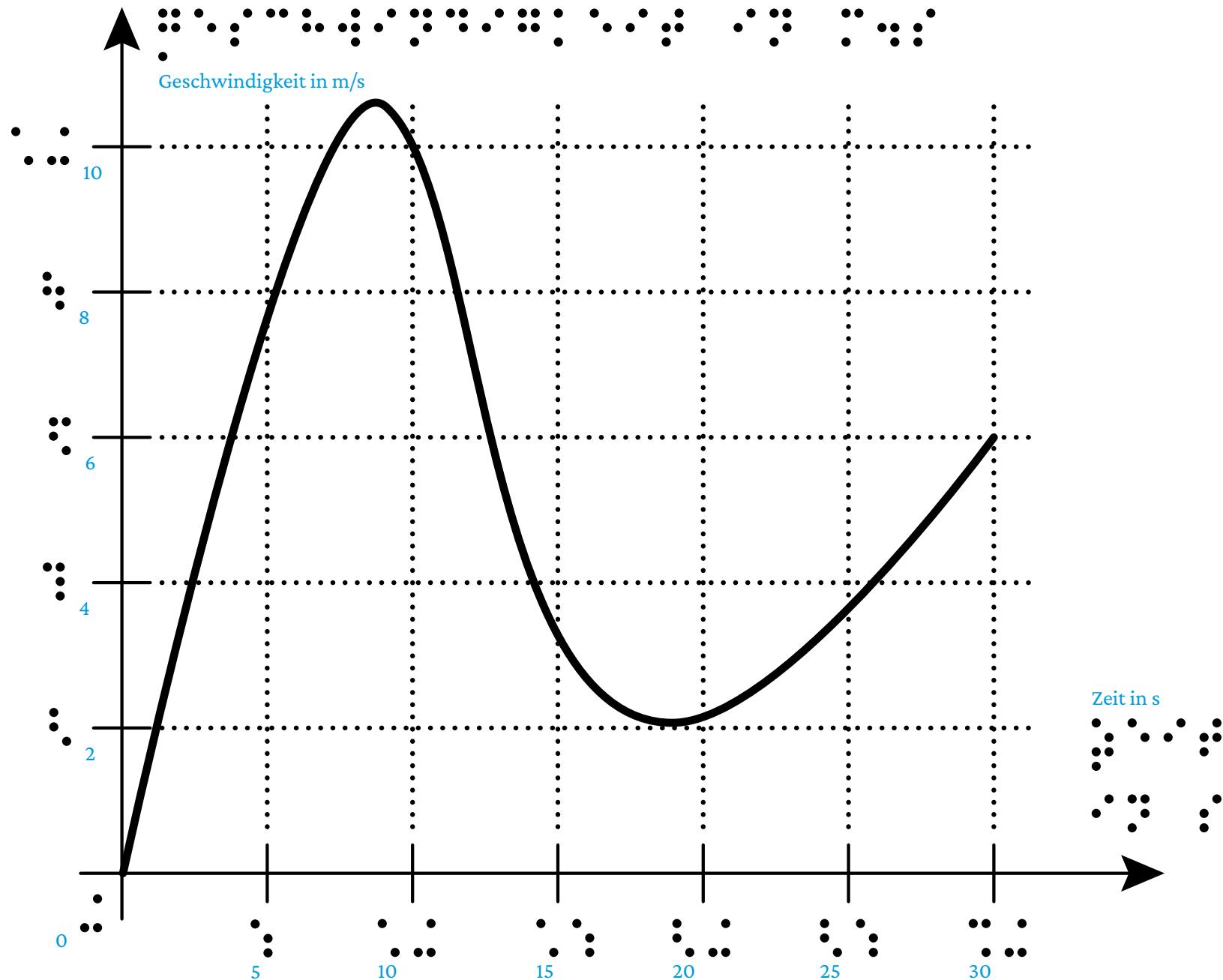
S.105 5.28 b)

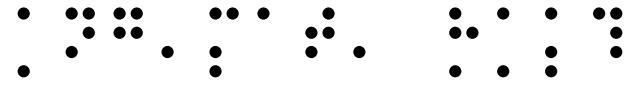


Ang. Mat. HAK4



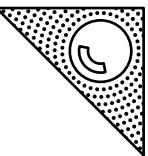
S.105 5.28 c)





Ang.Mat. HAK4

S.105 5.28 d)



Geschwindigkeit in m/s

25

20

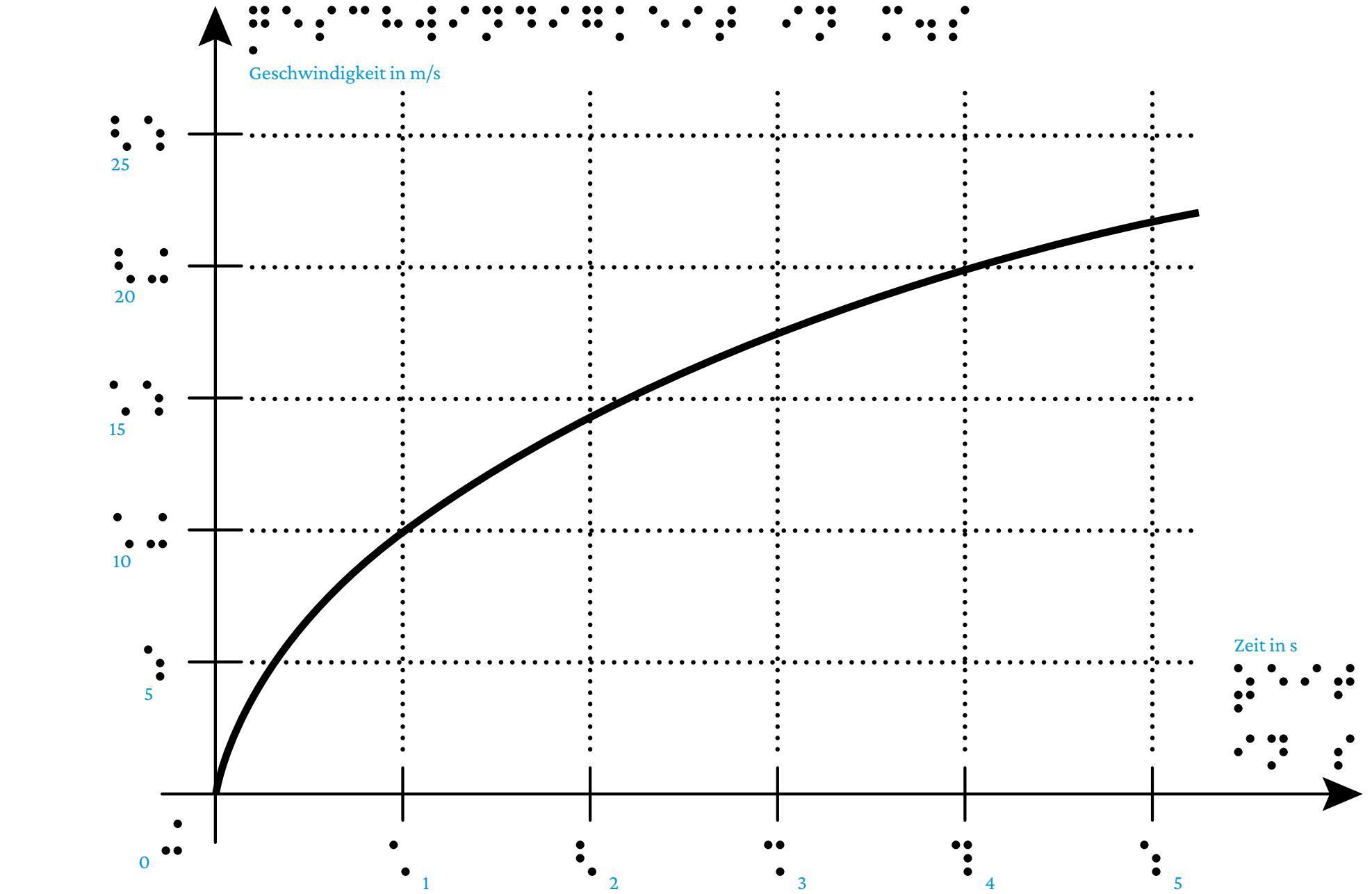
15

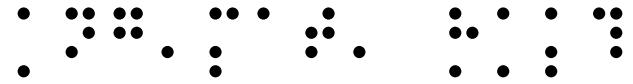
10

5

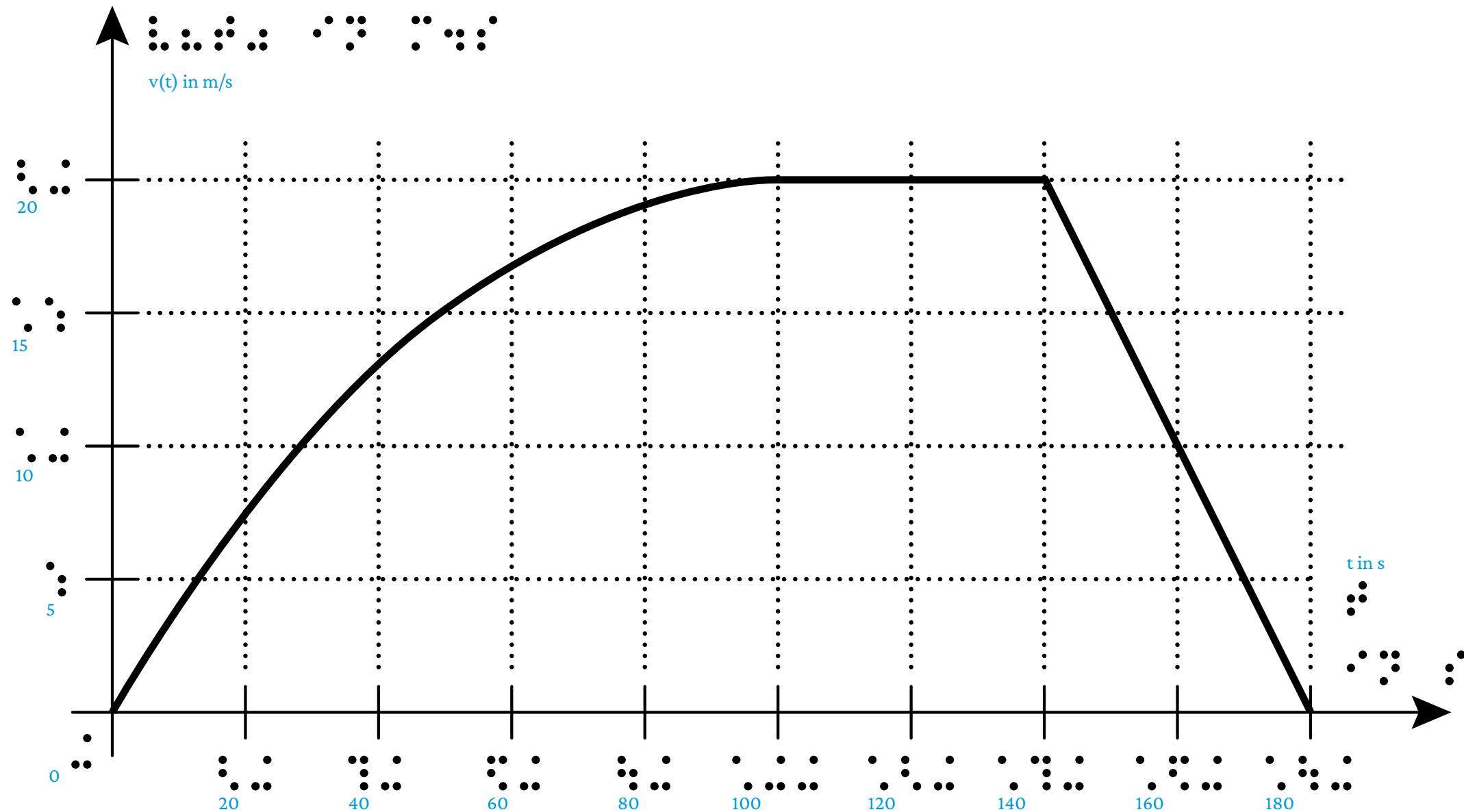
0

Zeit in s





Ang.Mat. HAK4





Legende:



f



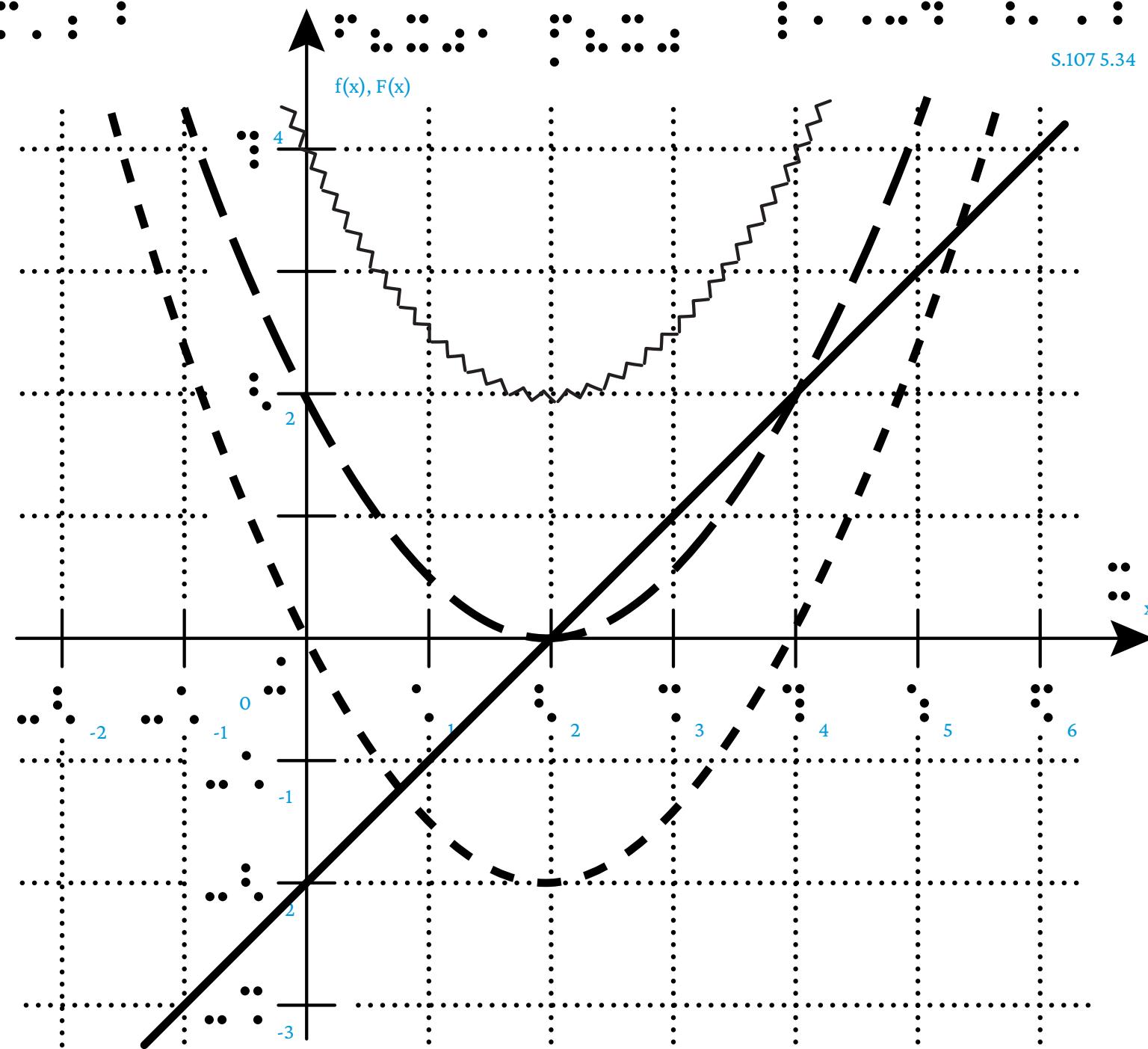
F_1



F_2



F_3

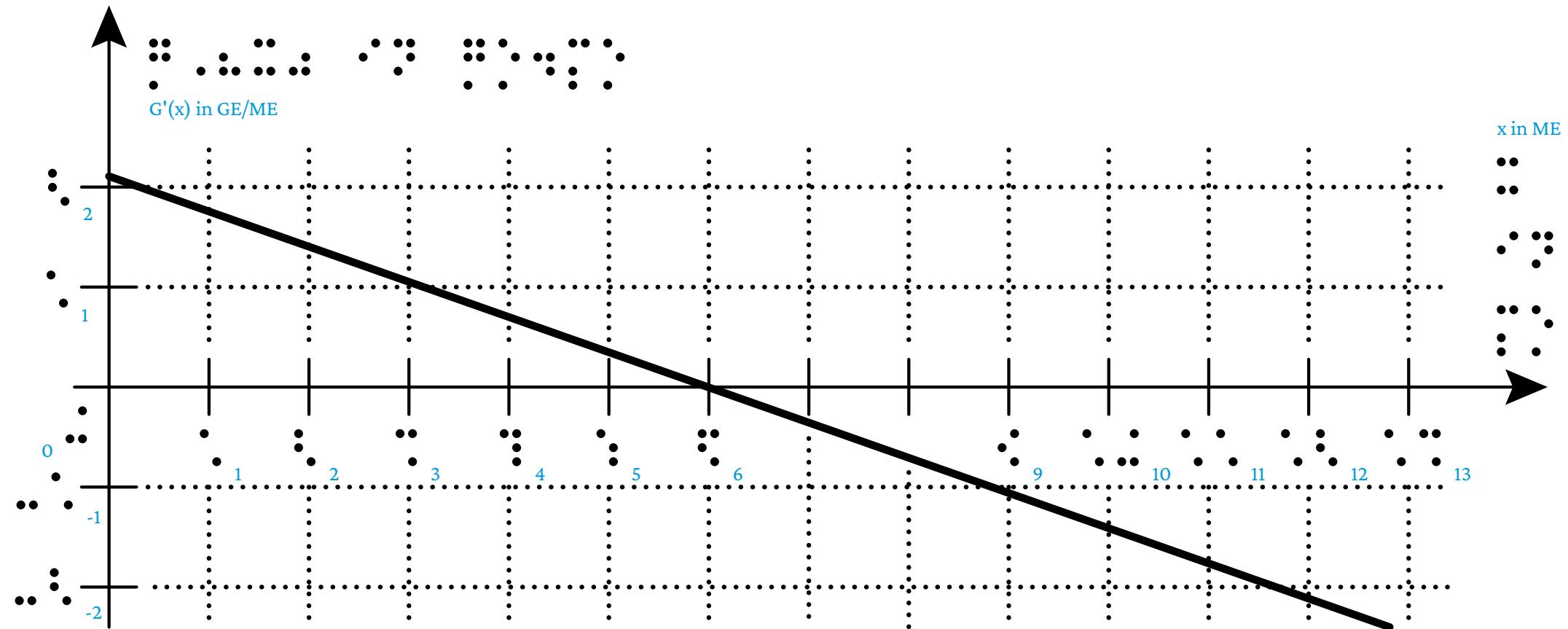
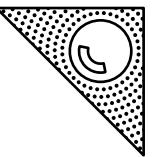


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Ang.Mat. HAK4

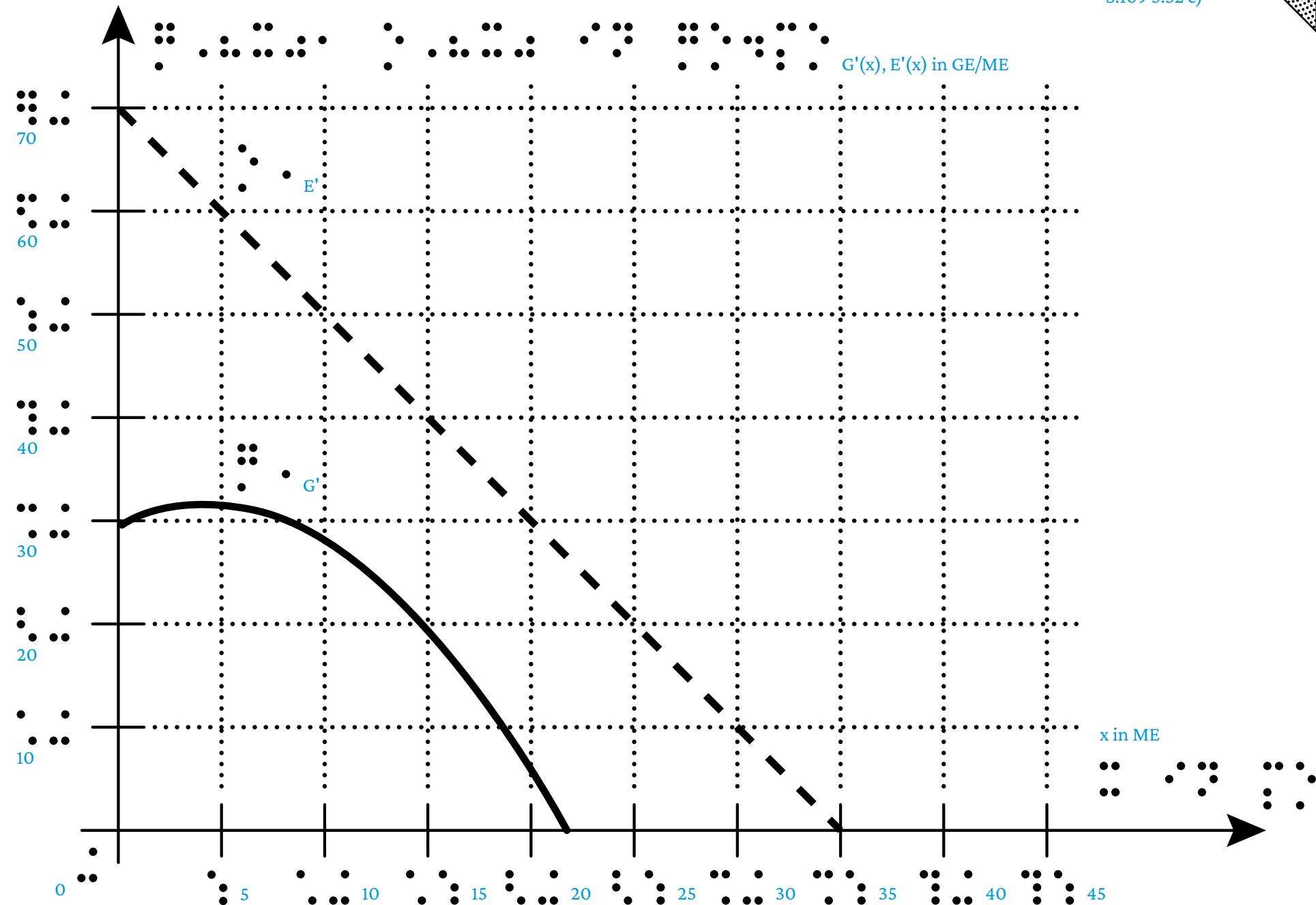
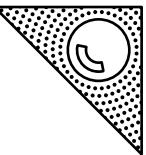
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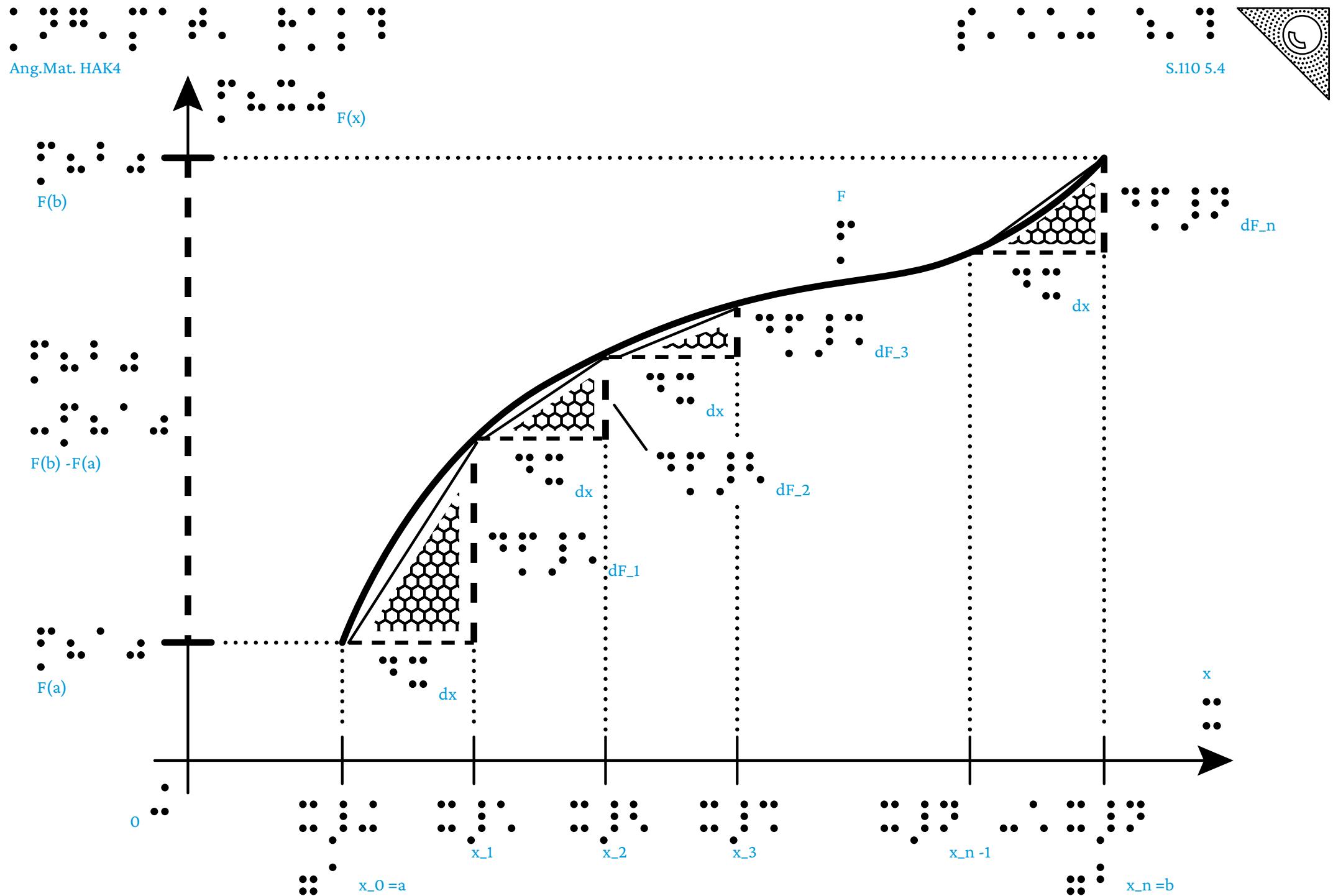
S.109 5.49

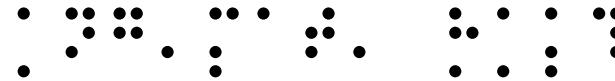


Ang.Mat. HAK4

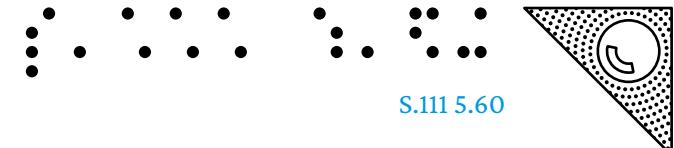
S.109 5.52 c)



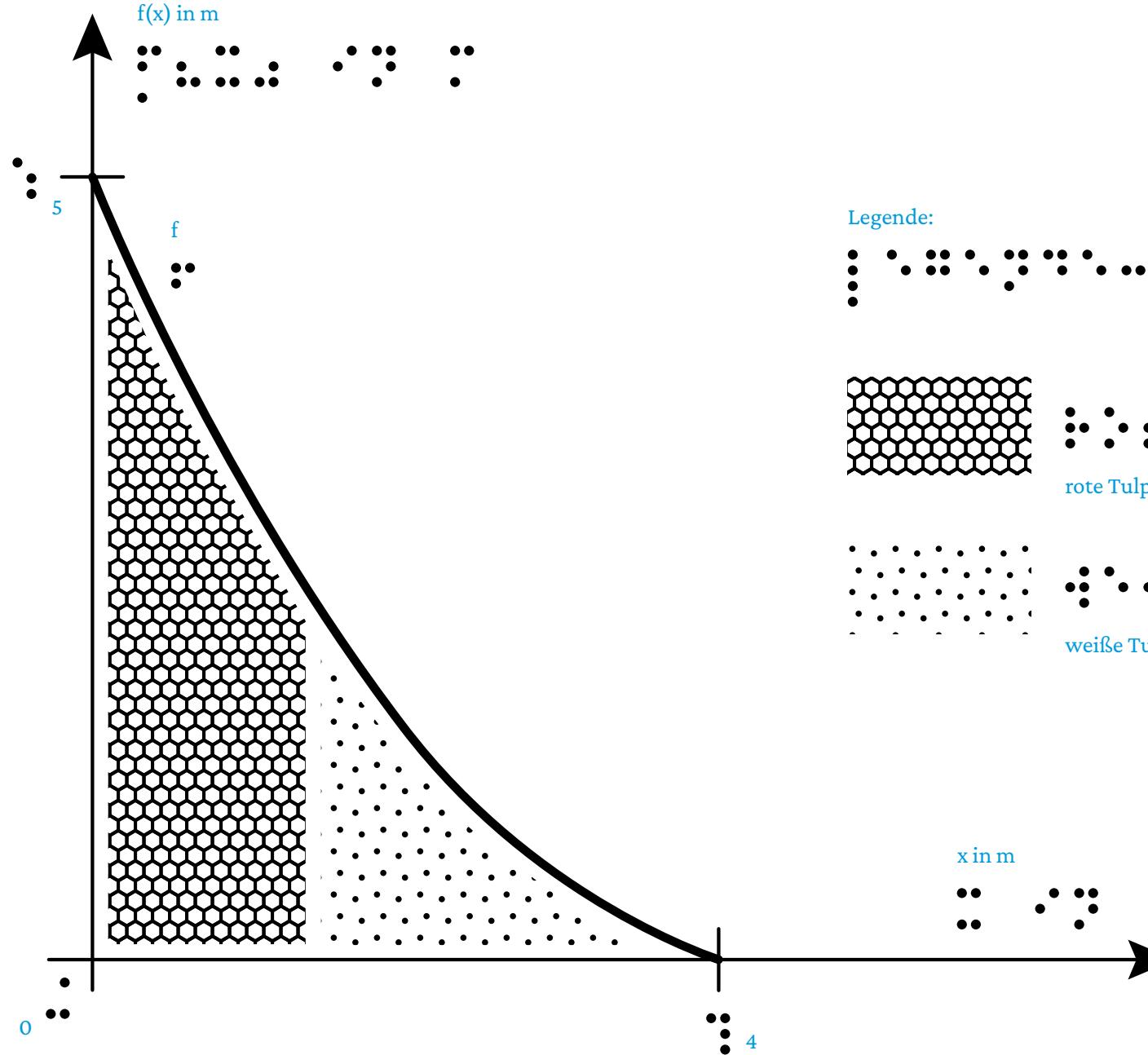


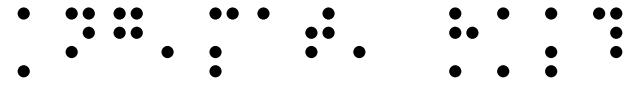


Ang. Mat. HAK4

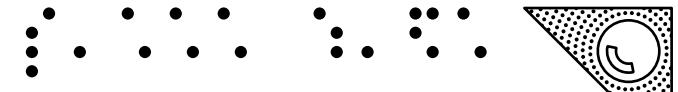


S.111 5.60

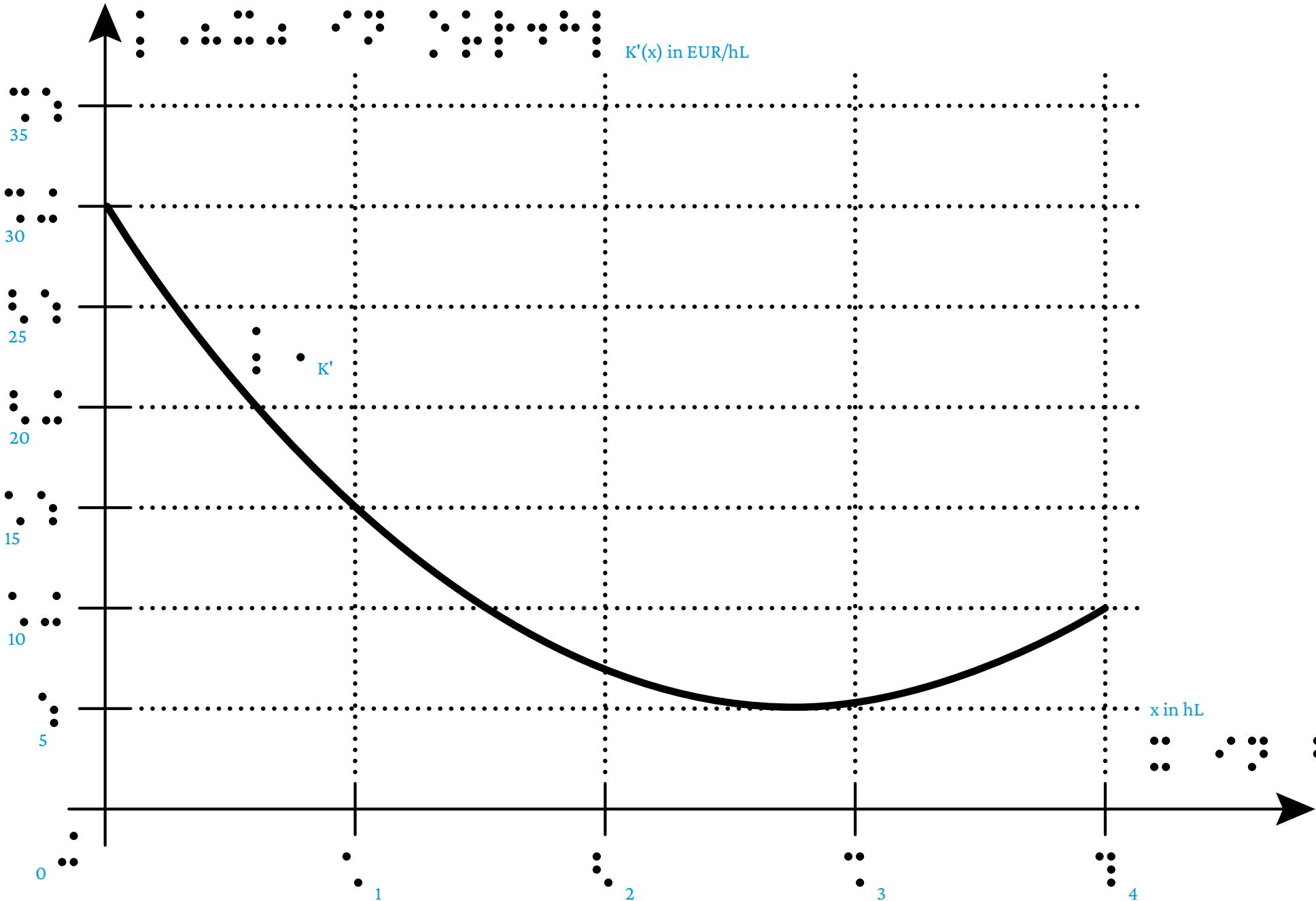
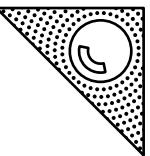


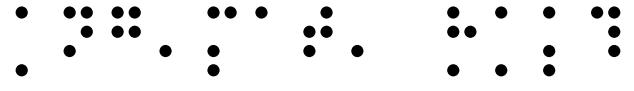


Ang.Mat. HAK4

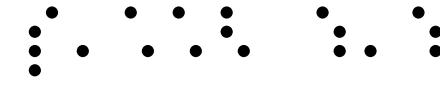


S.111 5.61

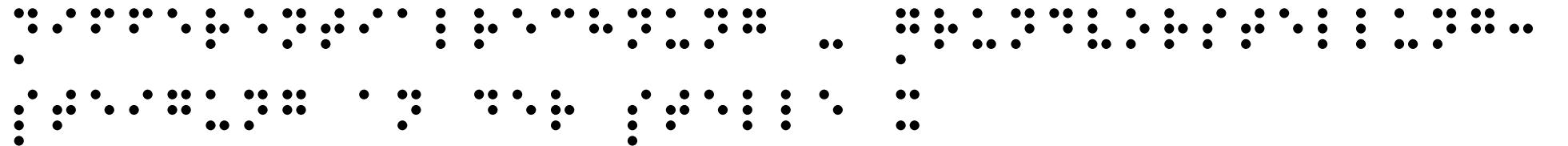
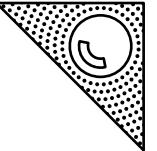




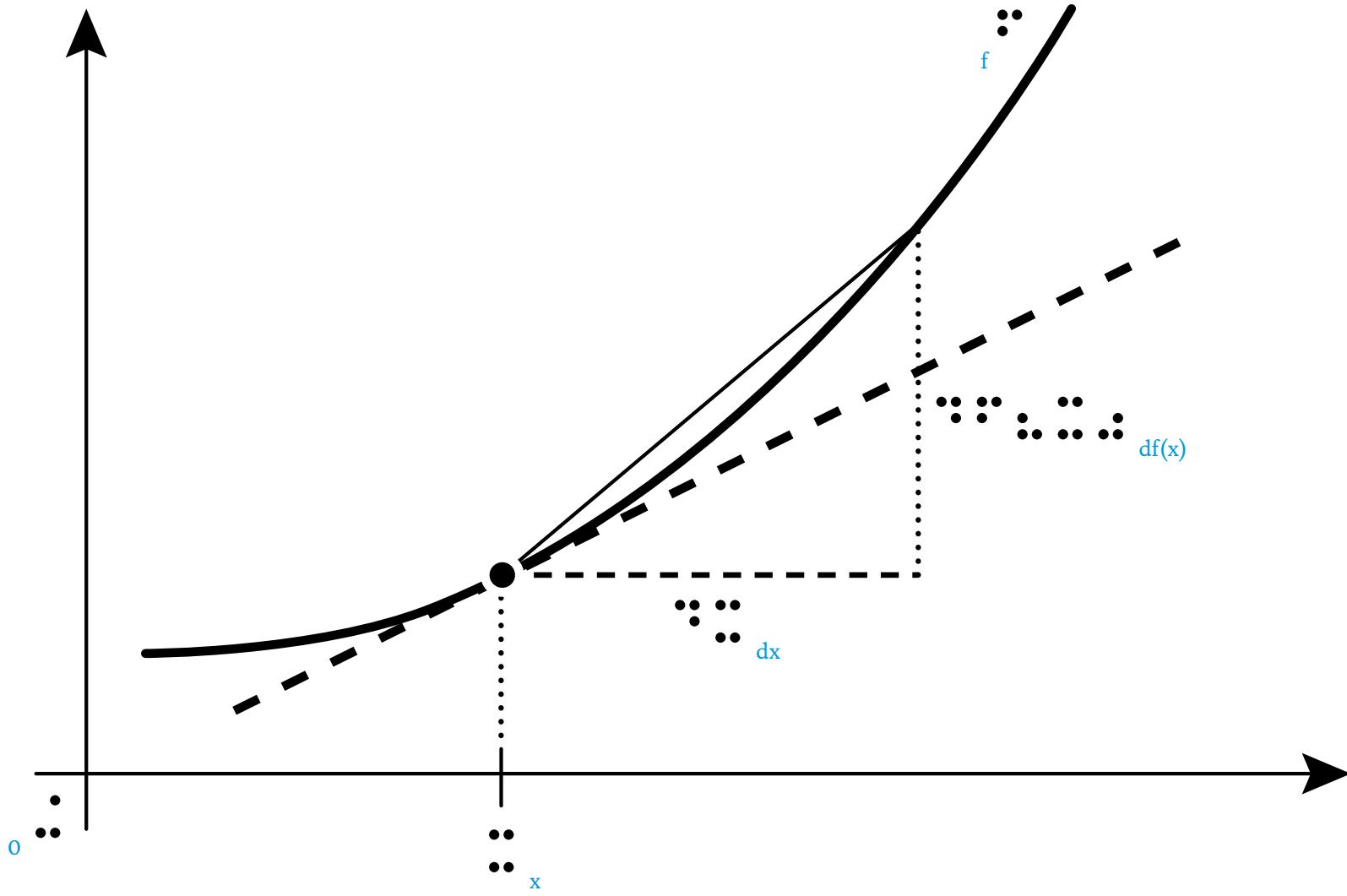
Ang. Mat. HAK4



S.112 5.5

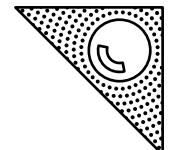


Differentialrechnung - Grundvorstellung: Steigung an der Stelle x



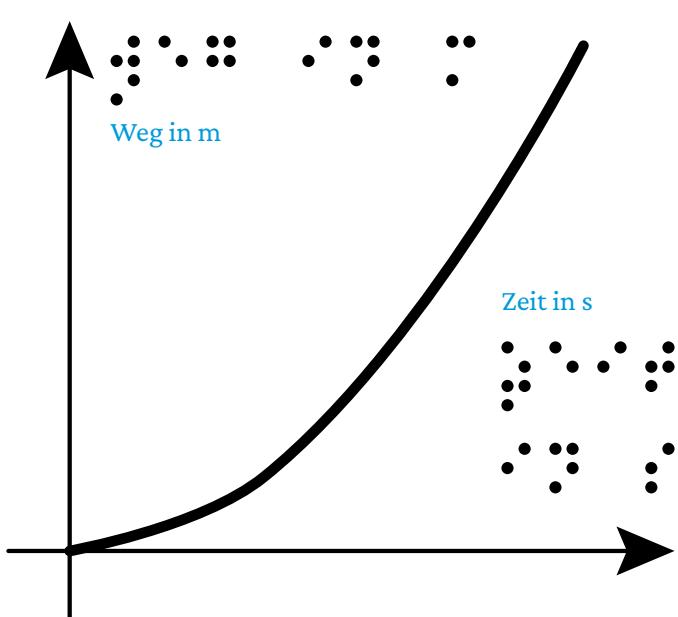
Ang. Mat. HAK4

S.112 5.5



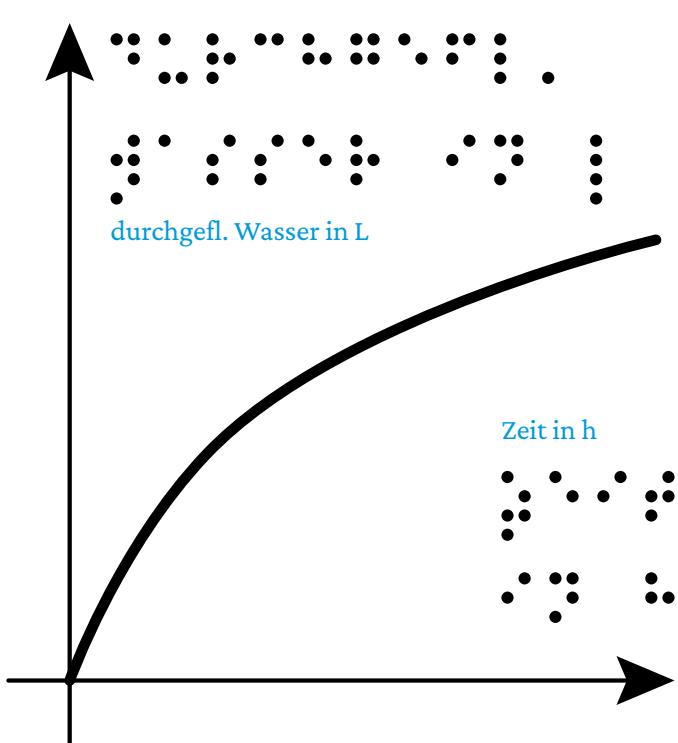
Differentialrechnung - Anwendungsbeispiele:

1) Weg -> Geschwindigkeit

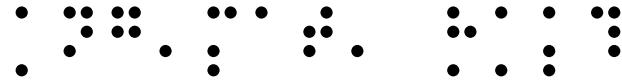


Weg in m / Zeit in s = Geschwindigkeit in m/s

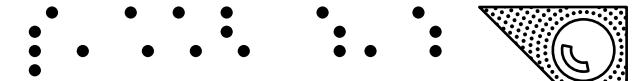
2) Bestand -> Änderungsrate



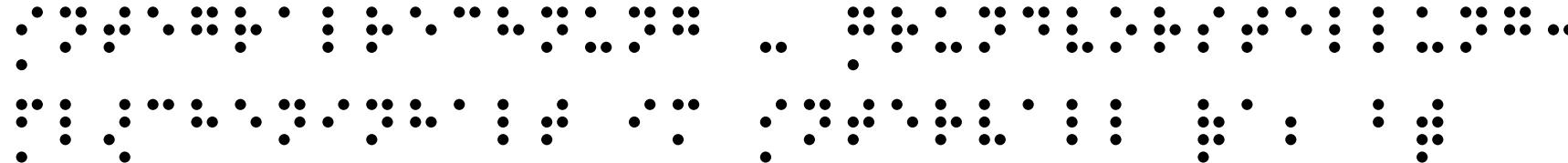
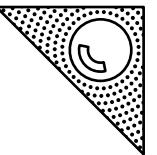
durchgef. Wasser Volumen in L / Zeit in h
= Durchflussrate in L/h



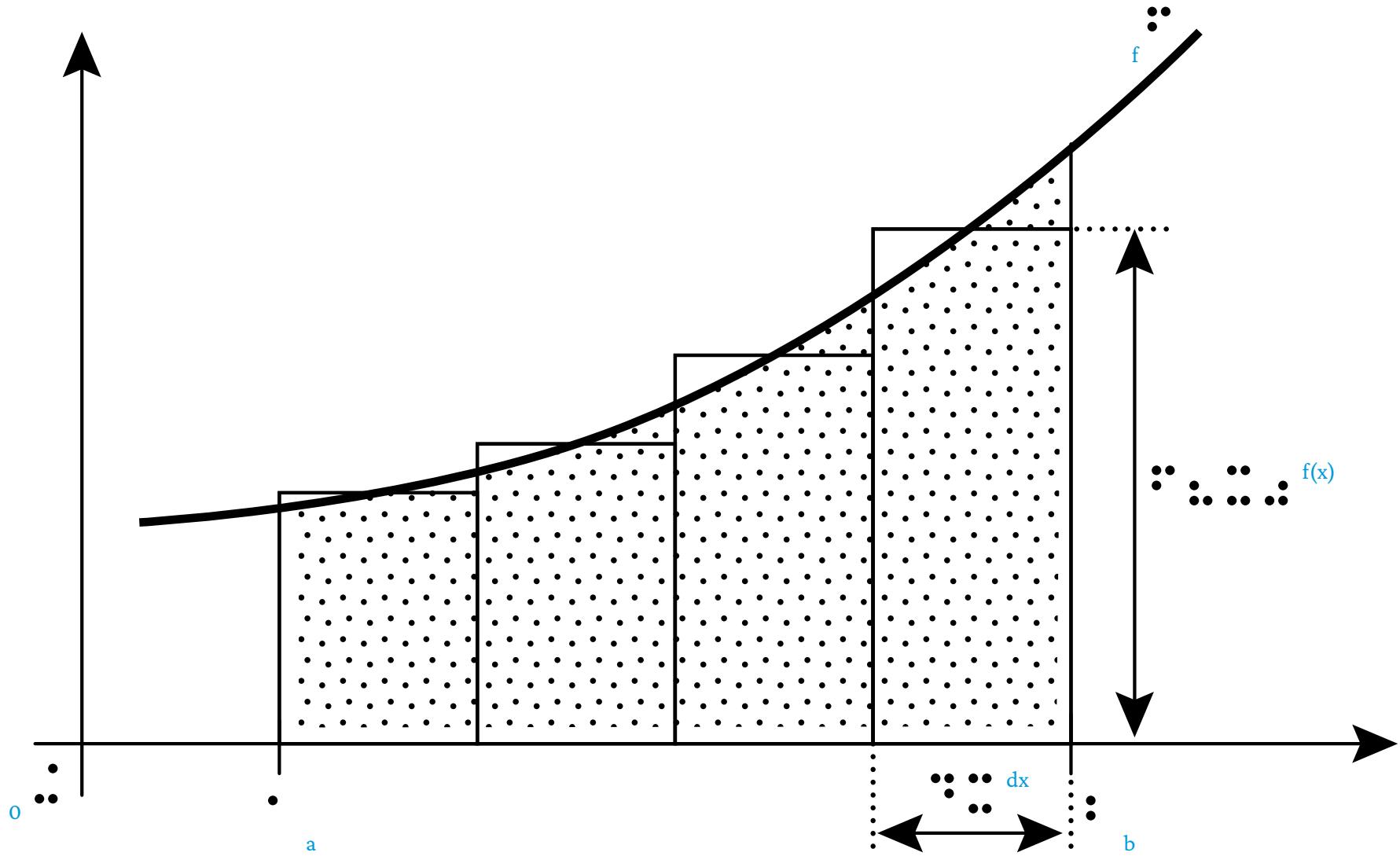
Ang. Mat. HAK4



S.112 5.5

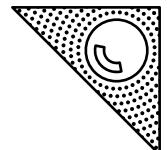


Integralrechnung - Grundvorstellung: Flächeninhalt im Intervall $[a; b]$



Ang. Mat. HAK4

S.112 5.5

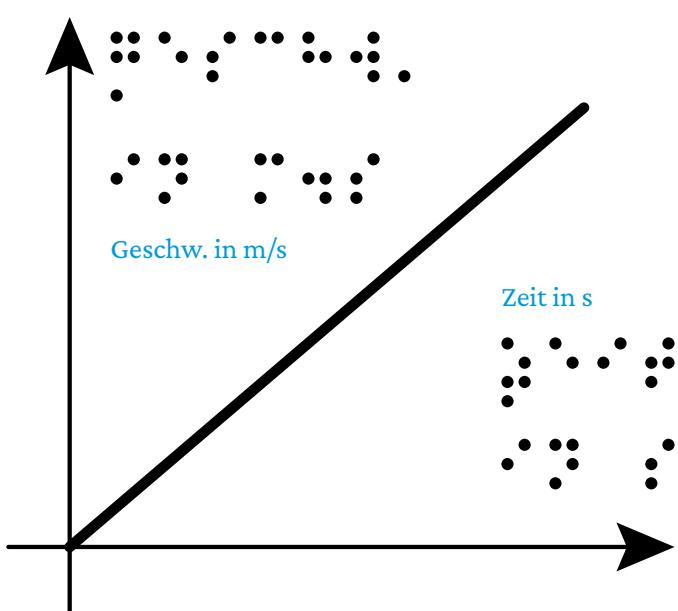


Ang. Mat. HAK4

S.112 5.5

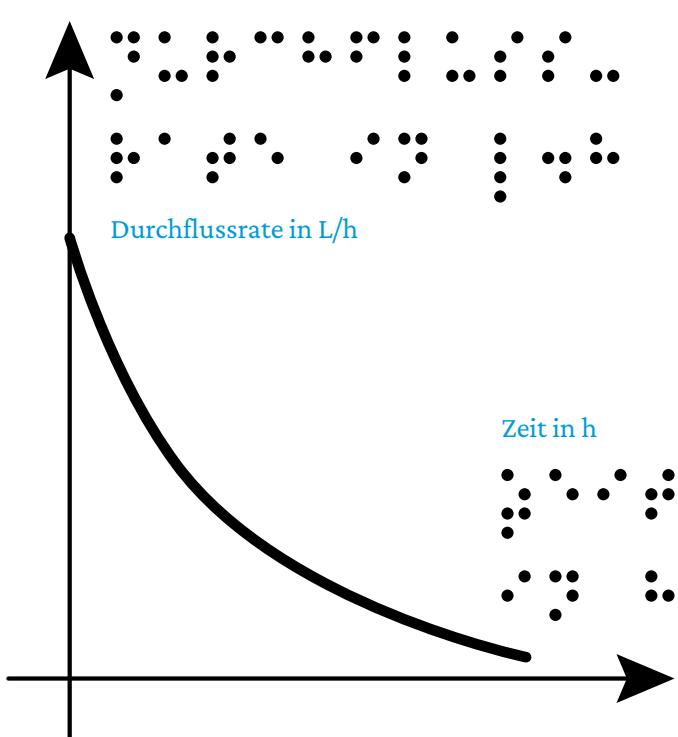
Integralrechnung - Anwendungsbeispiele:

1) Geschwindigkeit -> Weg

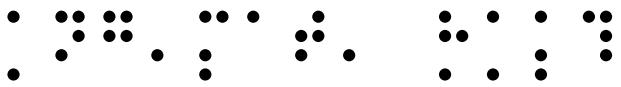


Geschwindigkeit * Zeit in m/s * s = Weg in m

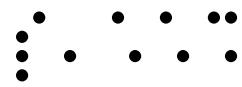
2) Änderungsrate -> Bestand



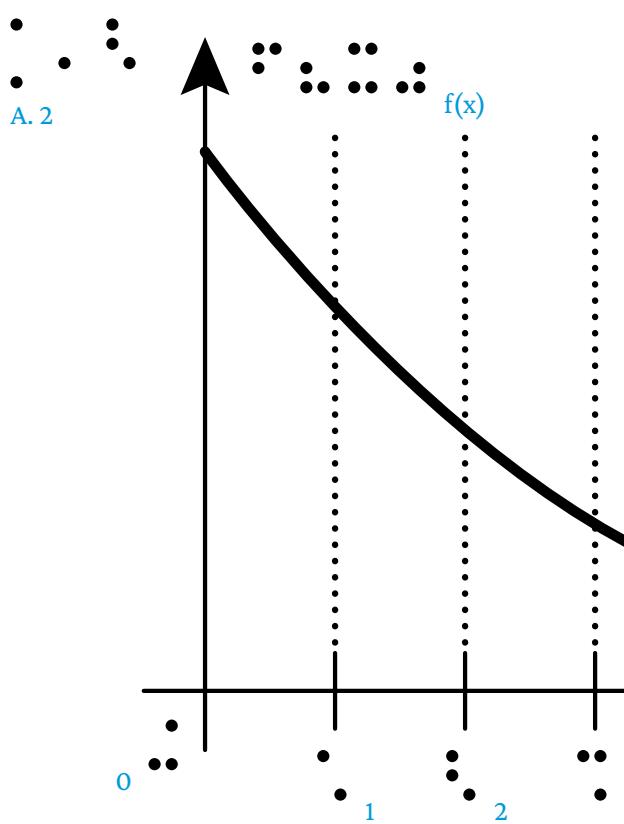
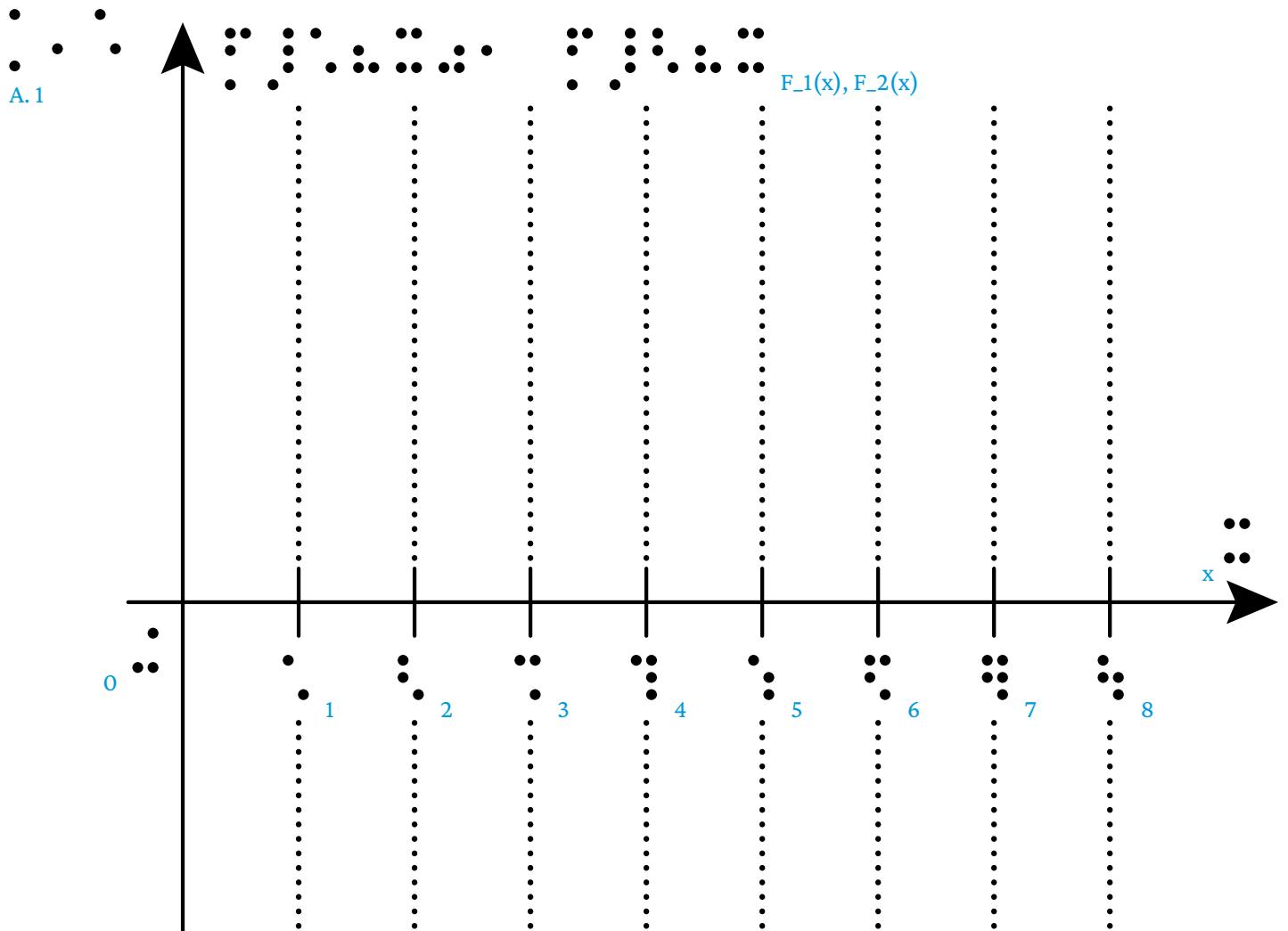
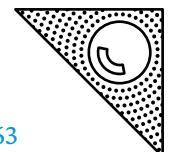
Durchflussrate * Zeit in L/h * h = durchgeflossenes Volumen in L

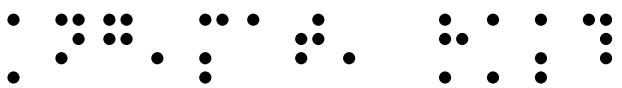


Ang. Mat. HAK4

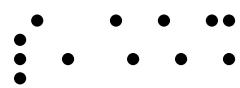


S.113 5.63

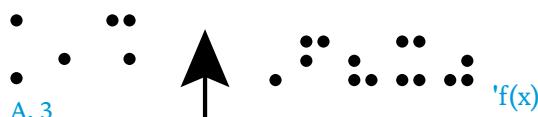
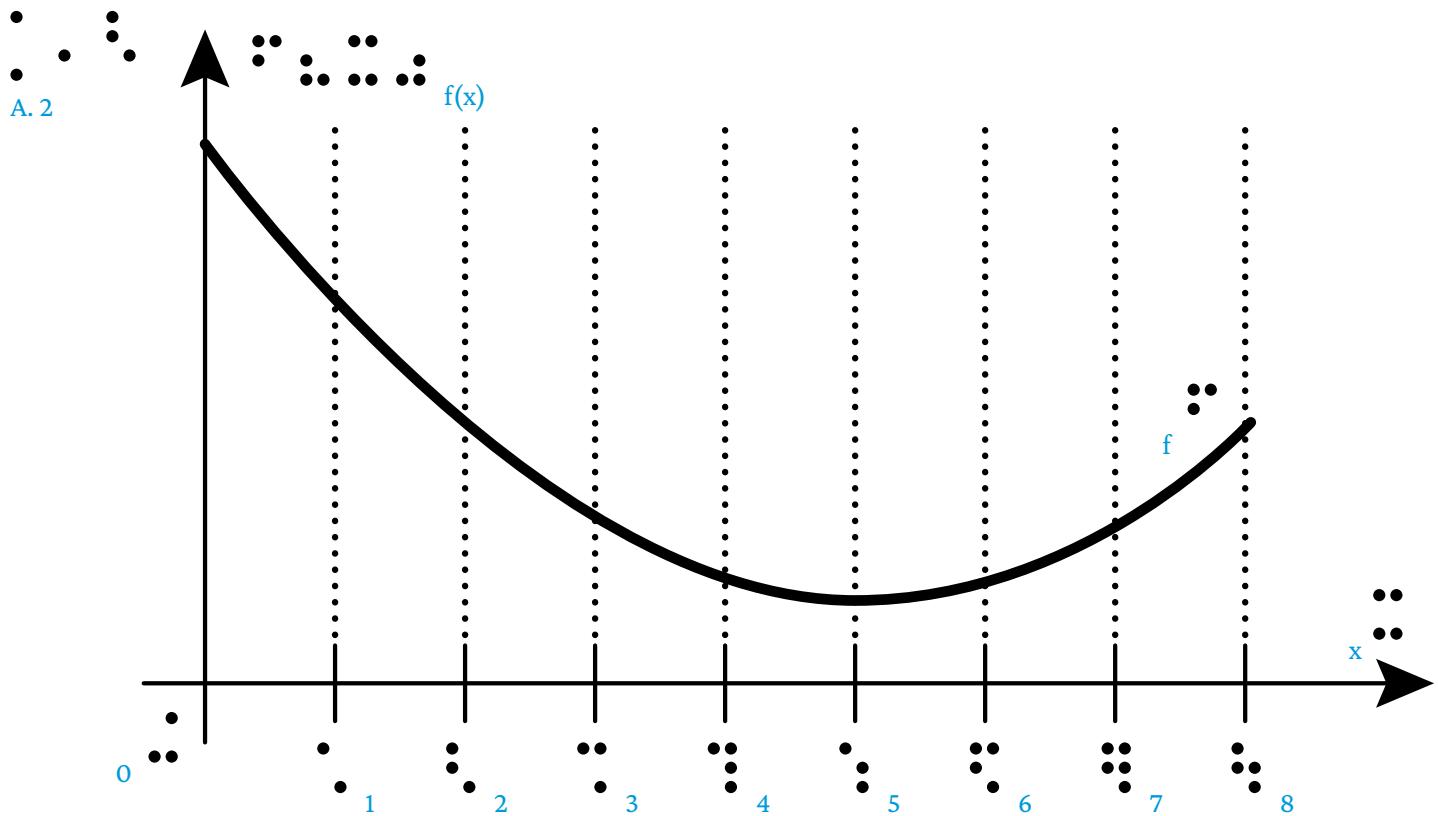
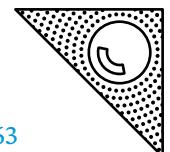




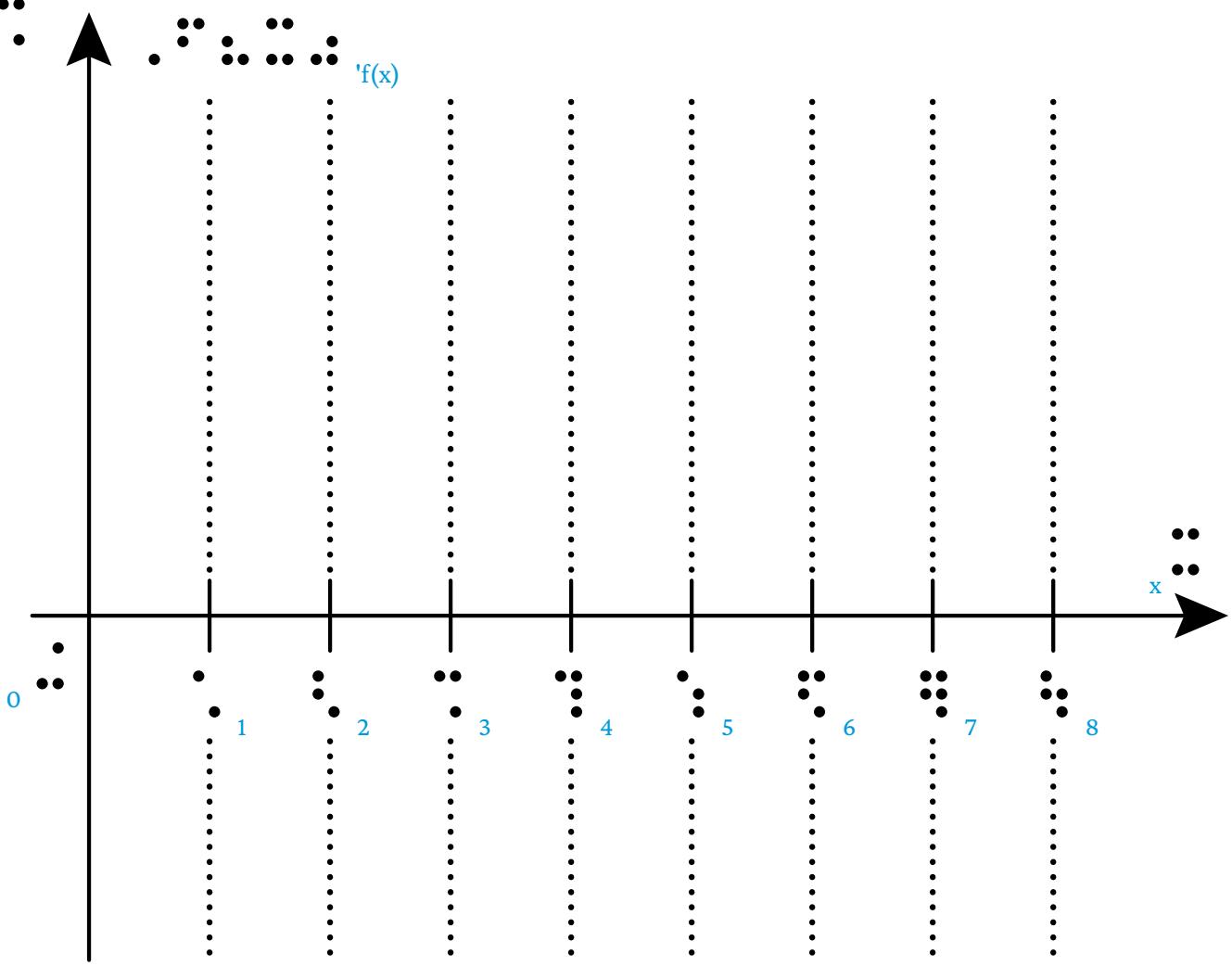
Ang. Mat. HAK4

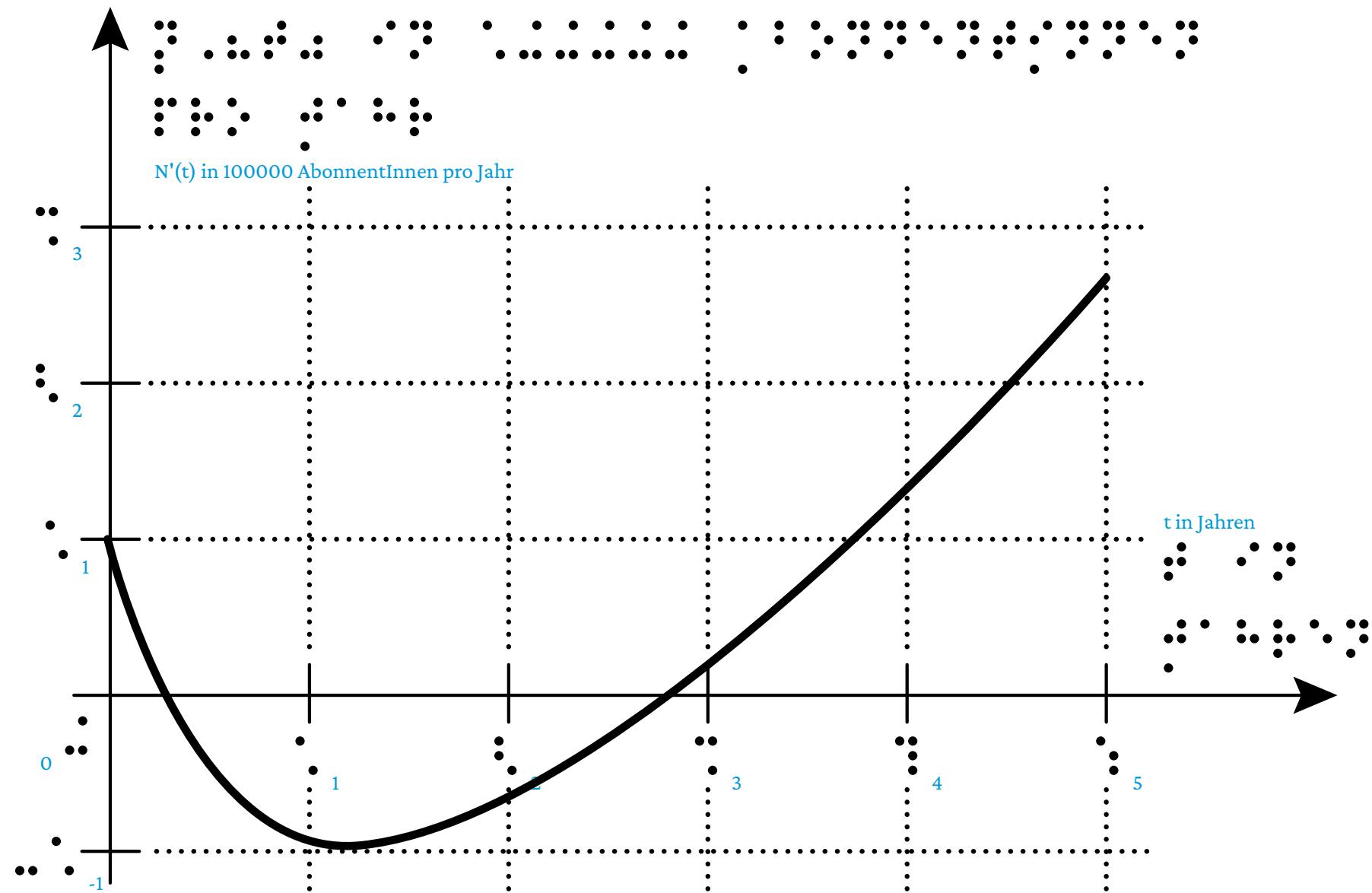
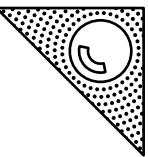
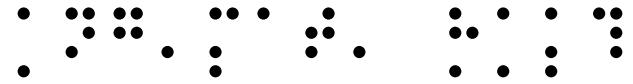


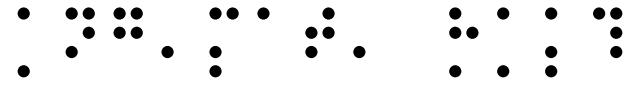
S.113 5.63



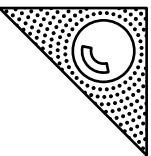
A. 3





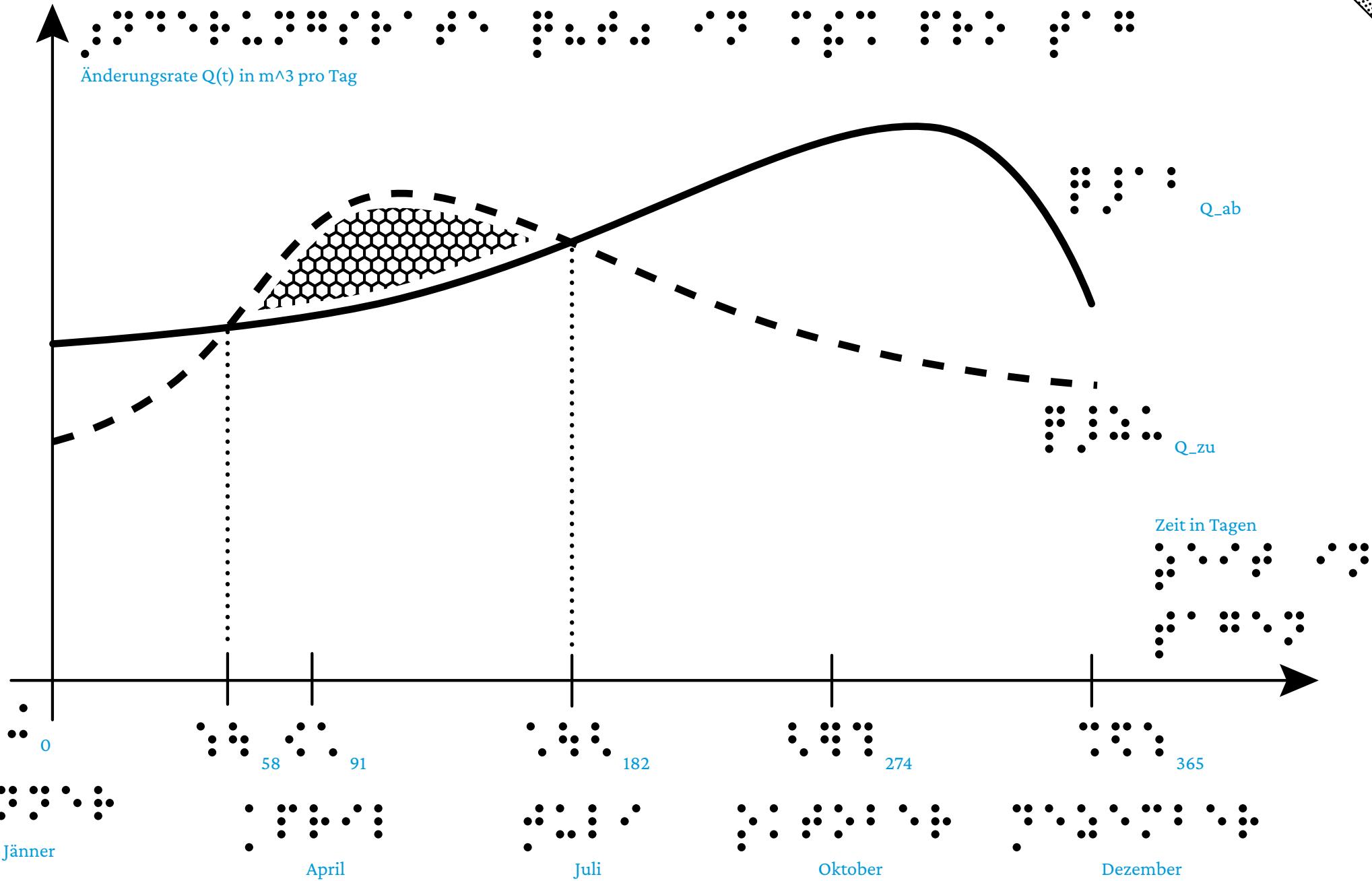


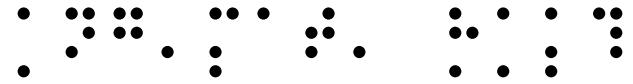
Ang. Mat. HAK4



S.113 5.66

Änderungsrate $Q(t)$ in m^3 pro Tag

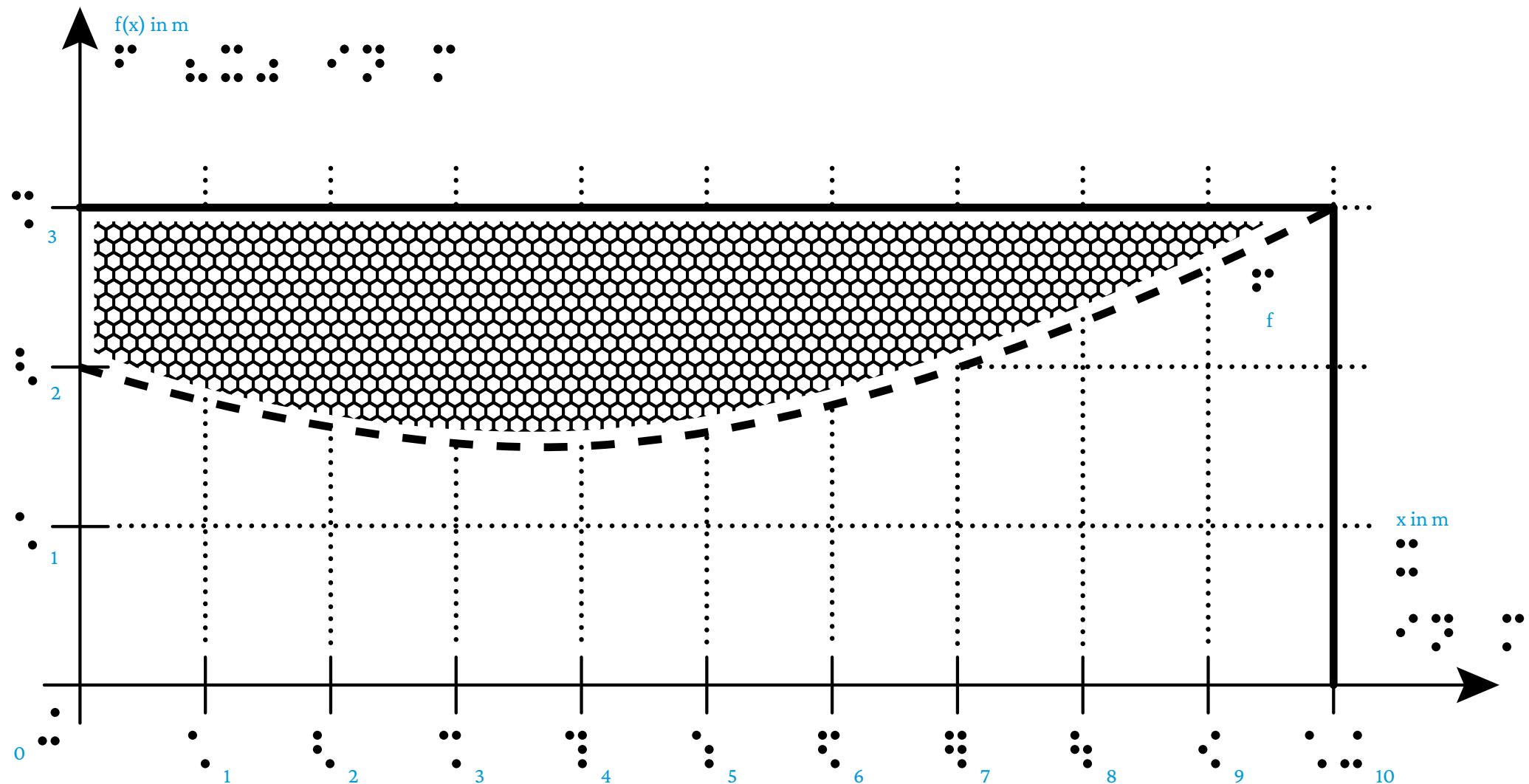
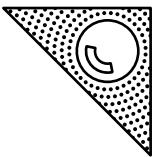


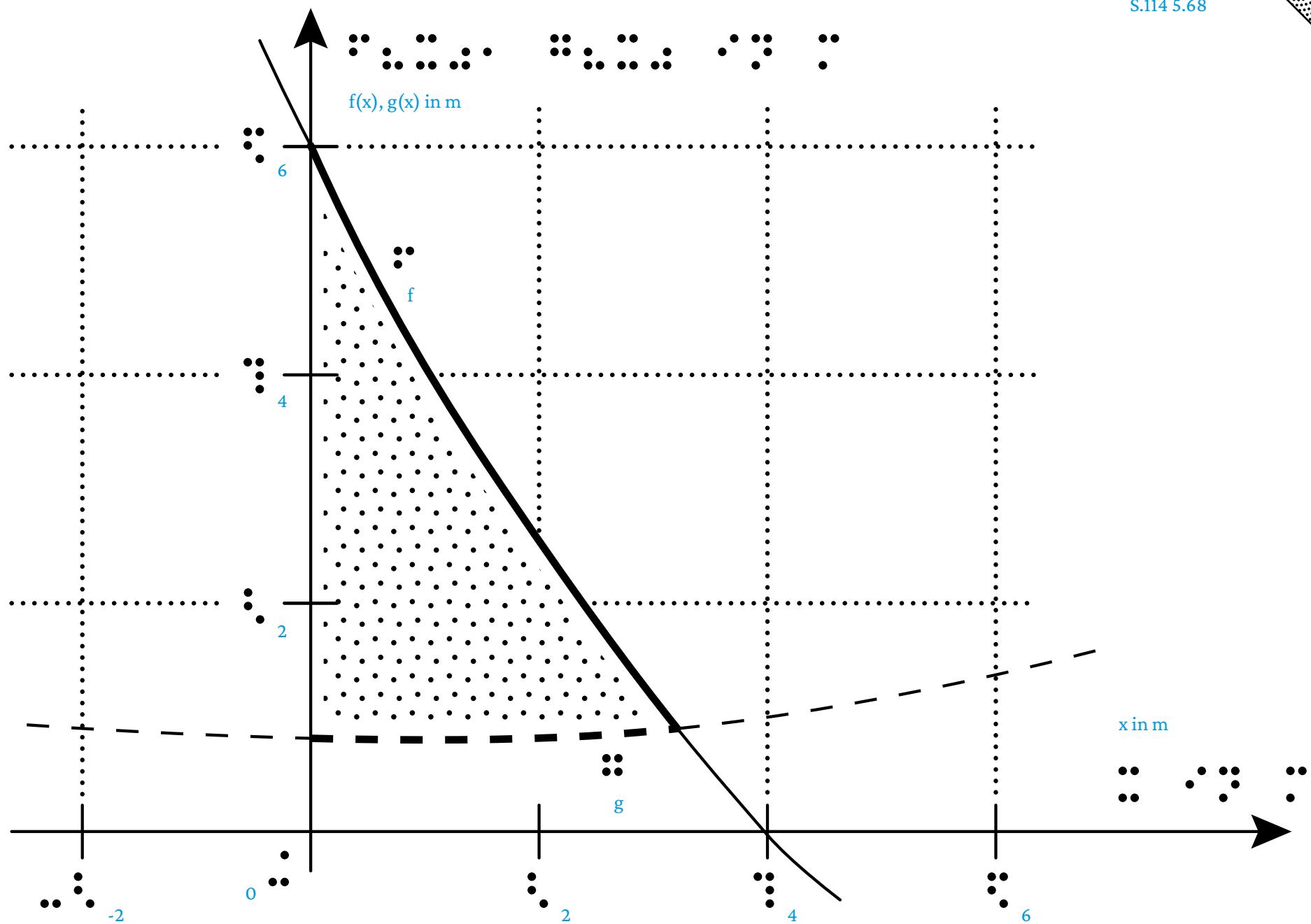
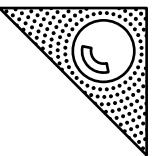
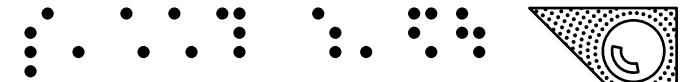
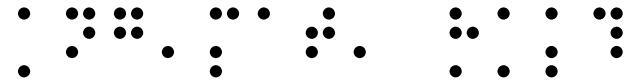


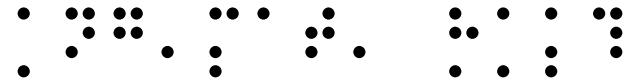
Ang. Mat. HAK4



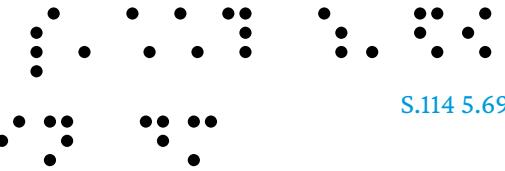
S.114 5.67



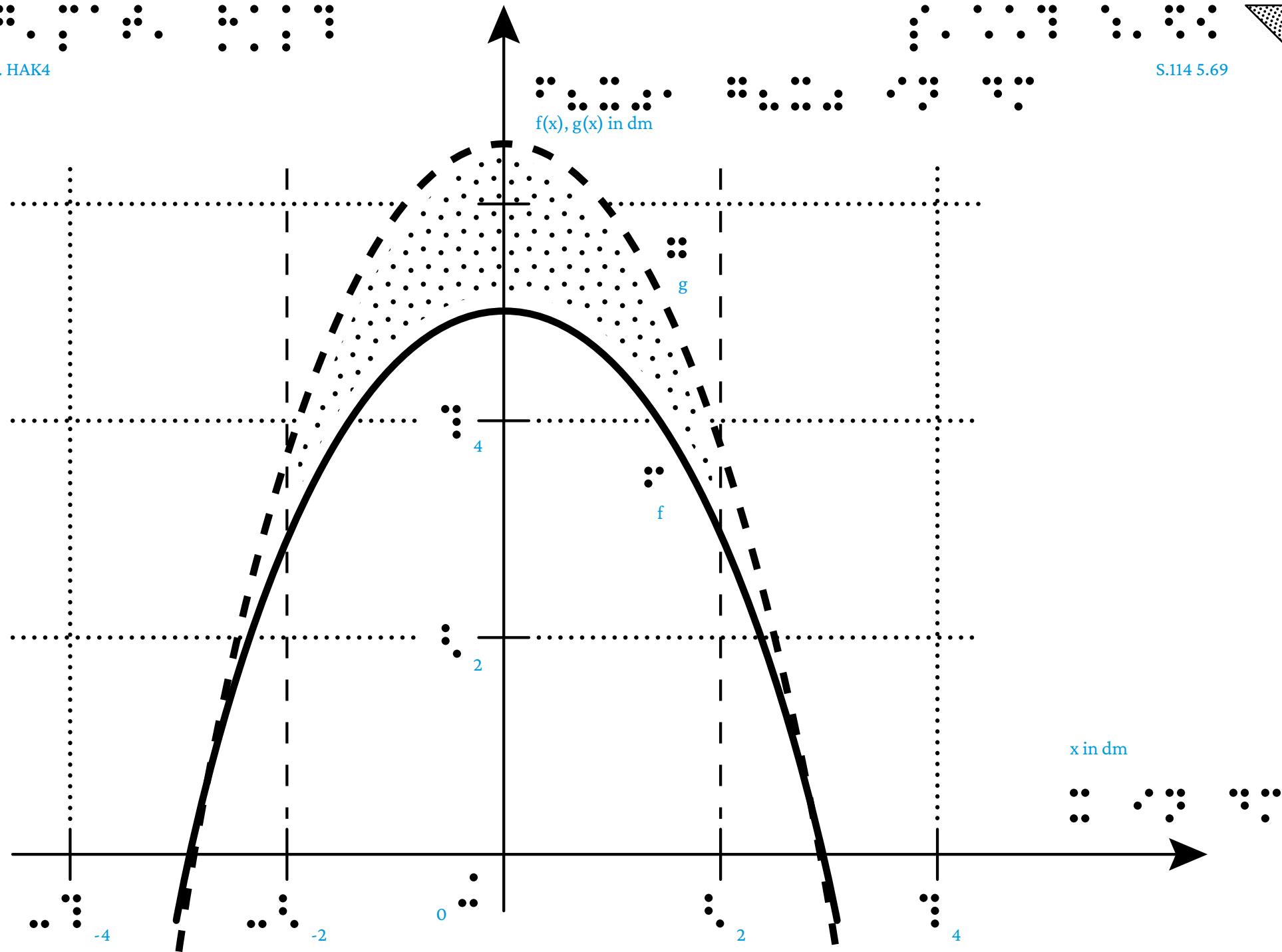
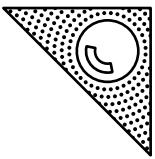


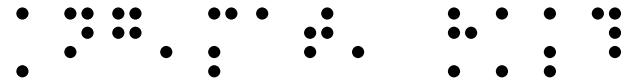


Ang. Mat. HAK4

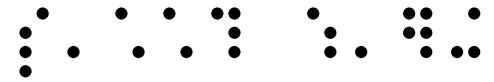


S.114 5.69

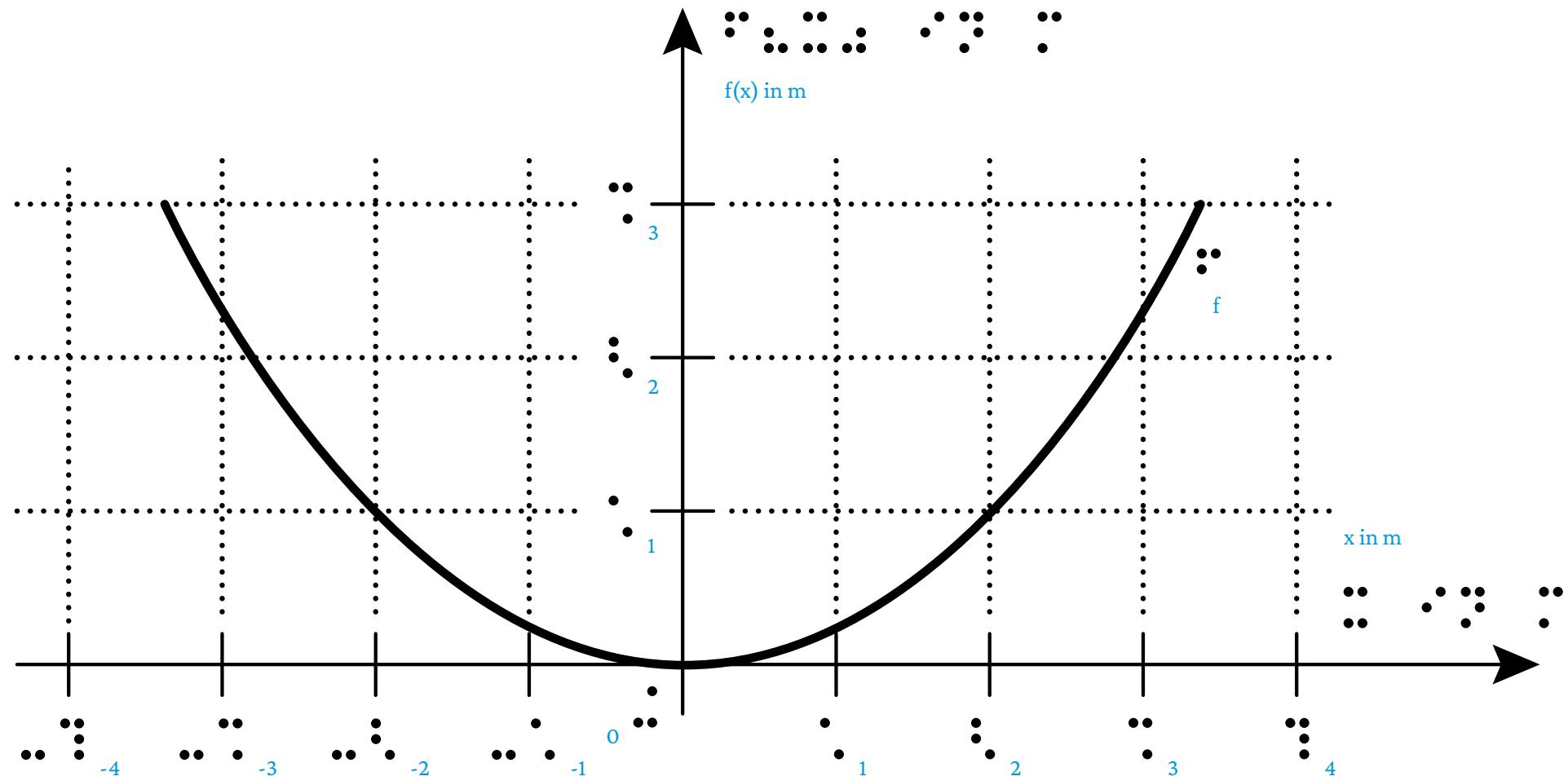
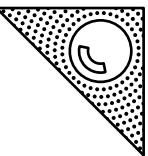


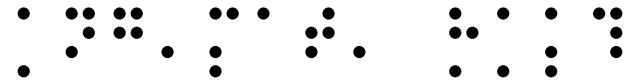


Ang. Mat. HAK4



S.114 5.70

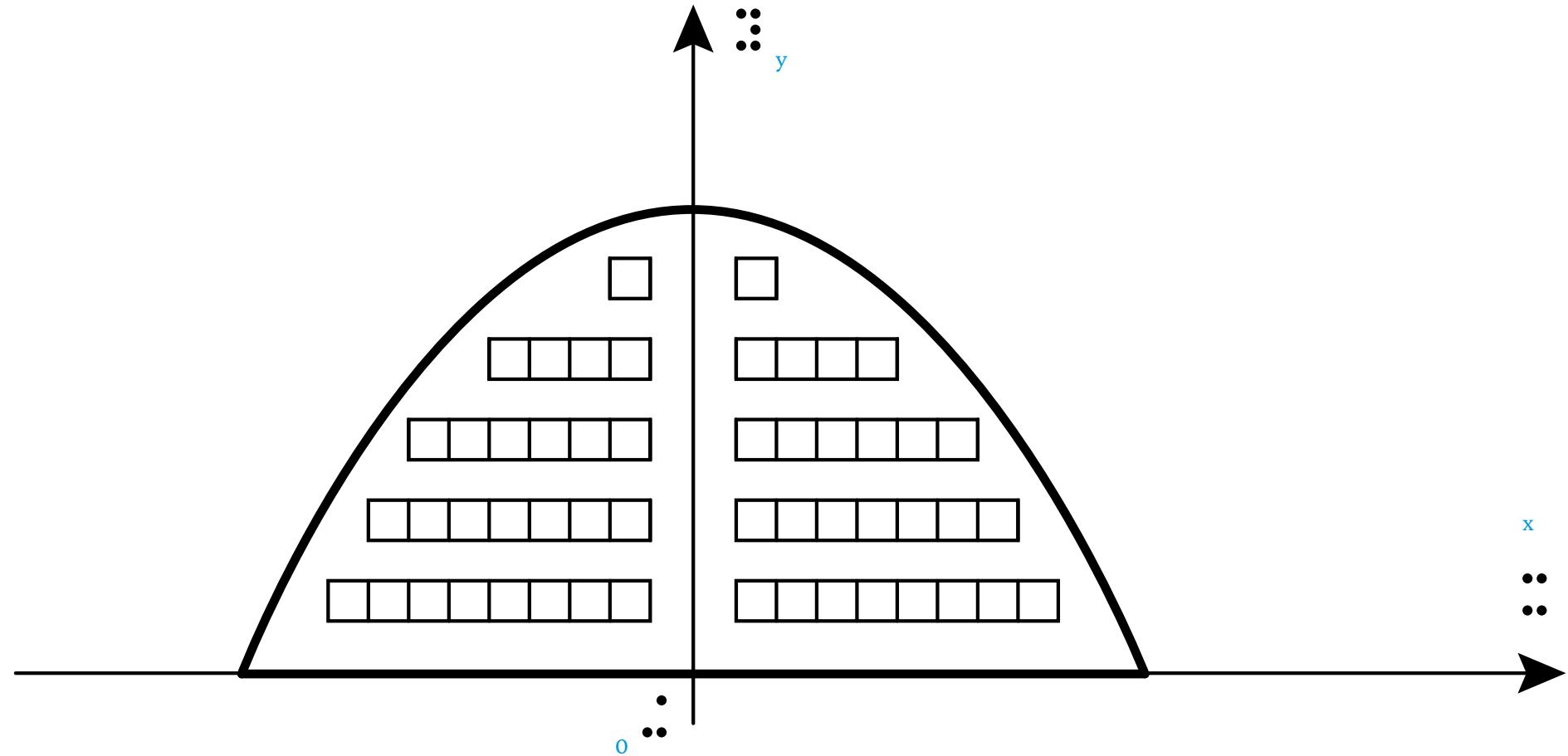


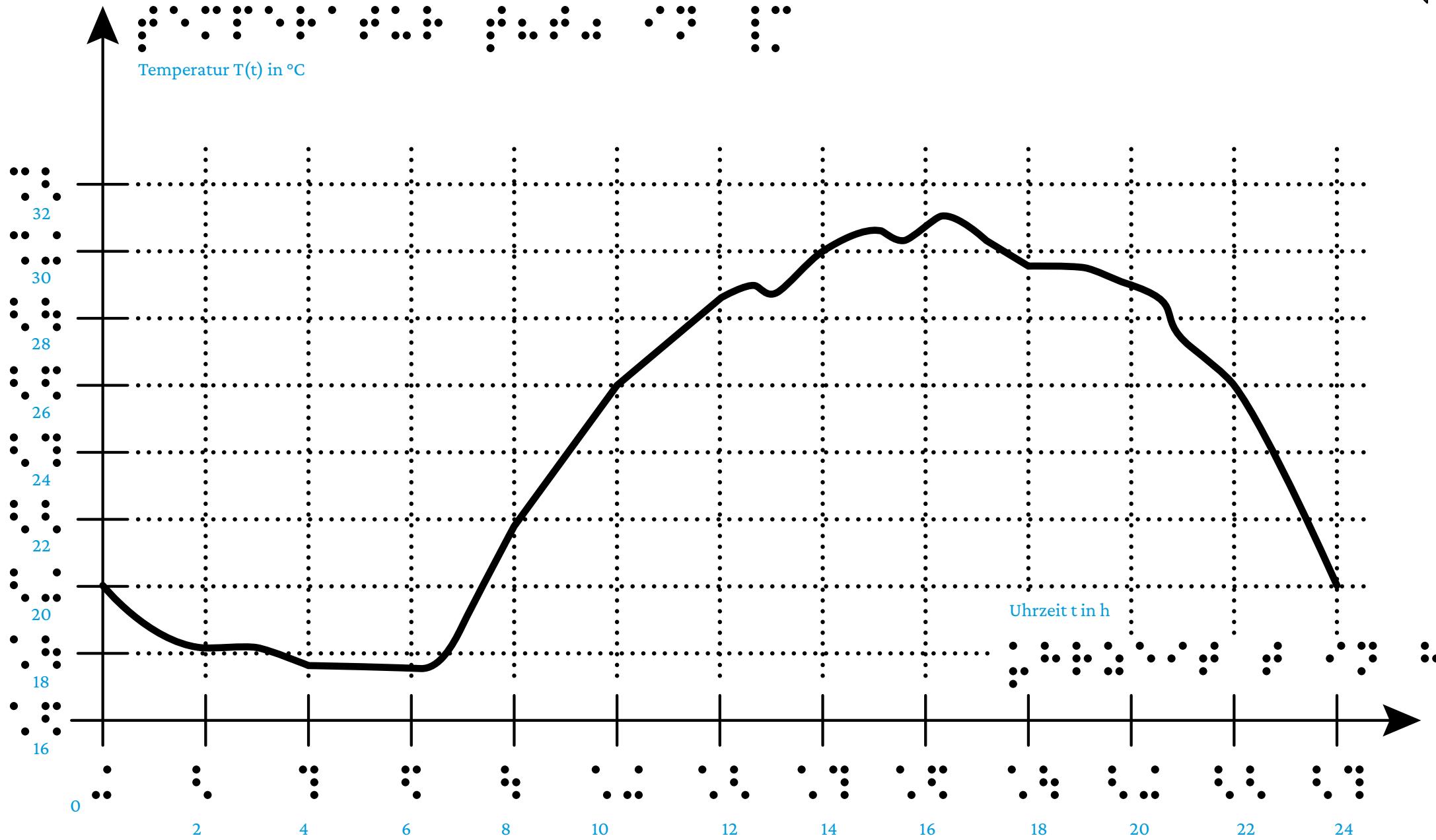
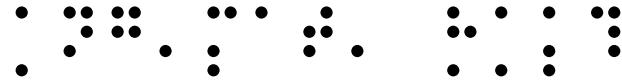


Ang. Mat. HAK4



S.115 5.71

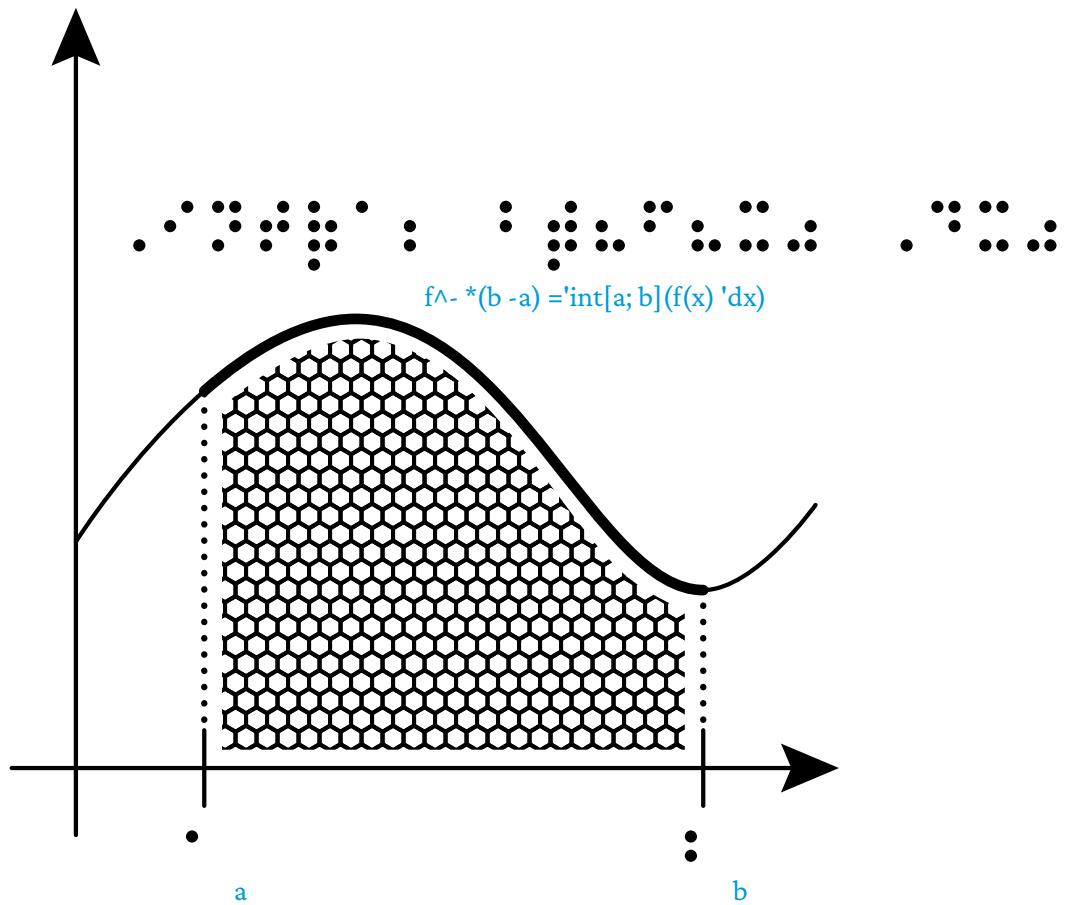
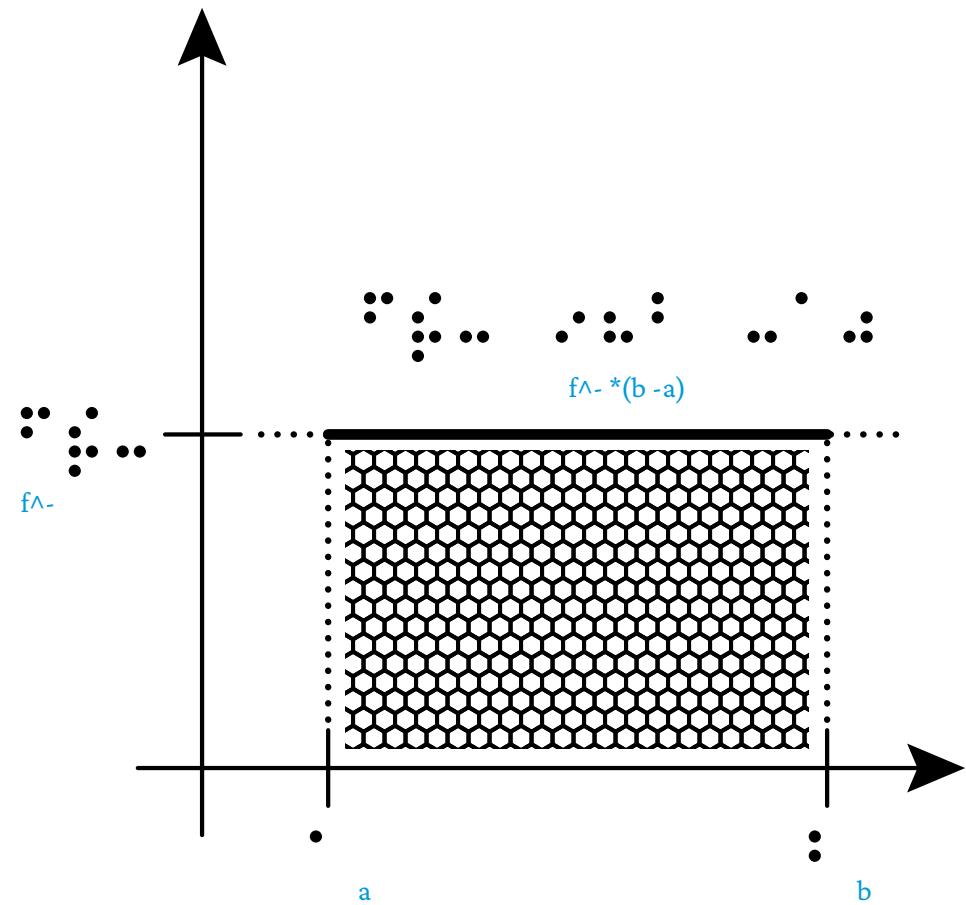


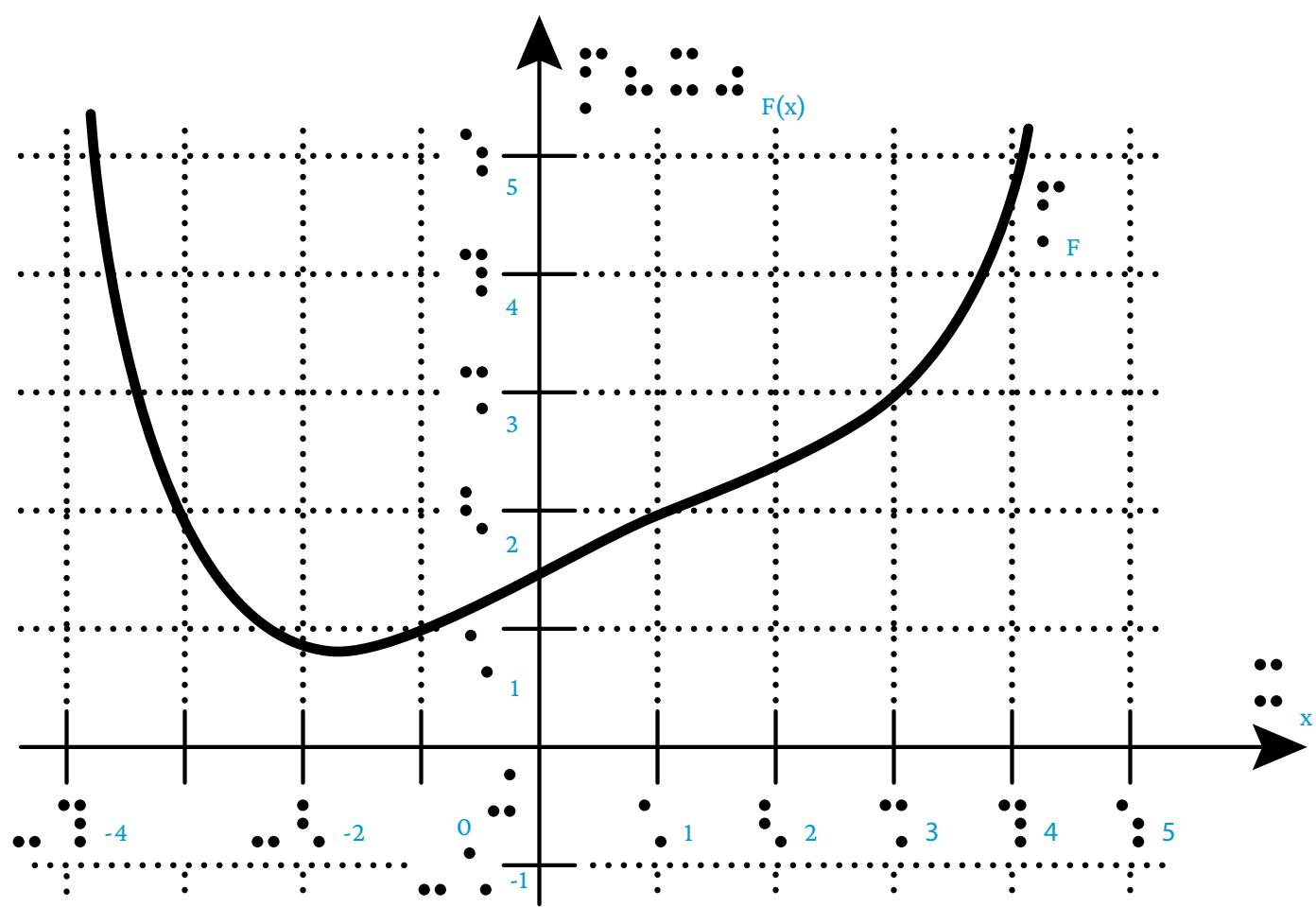
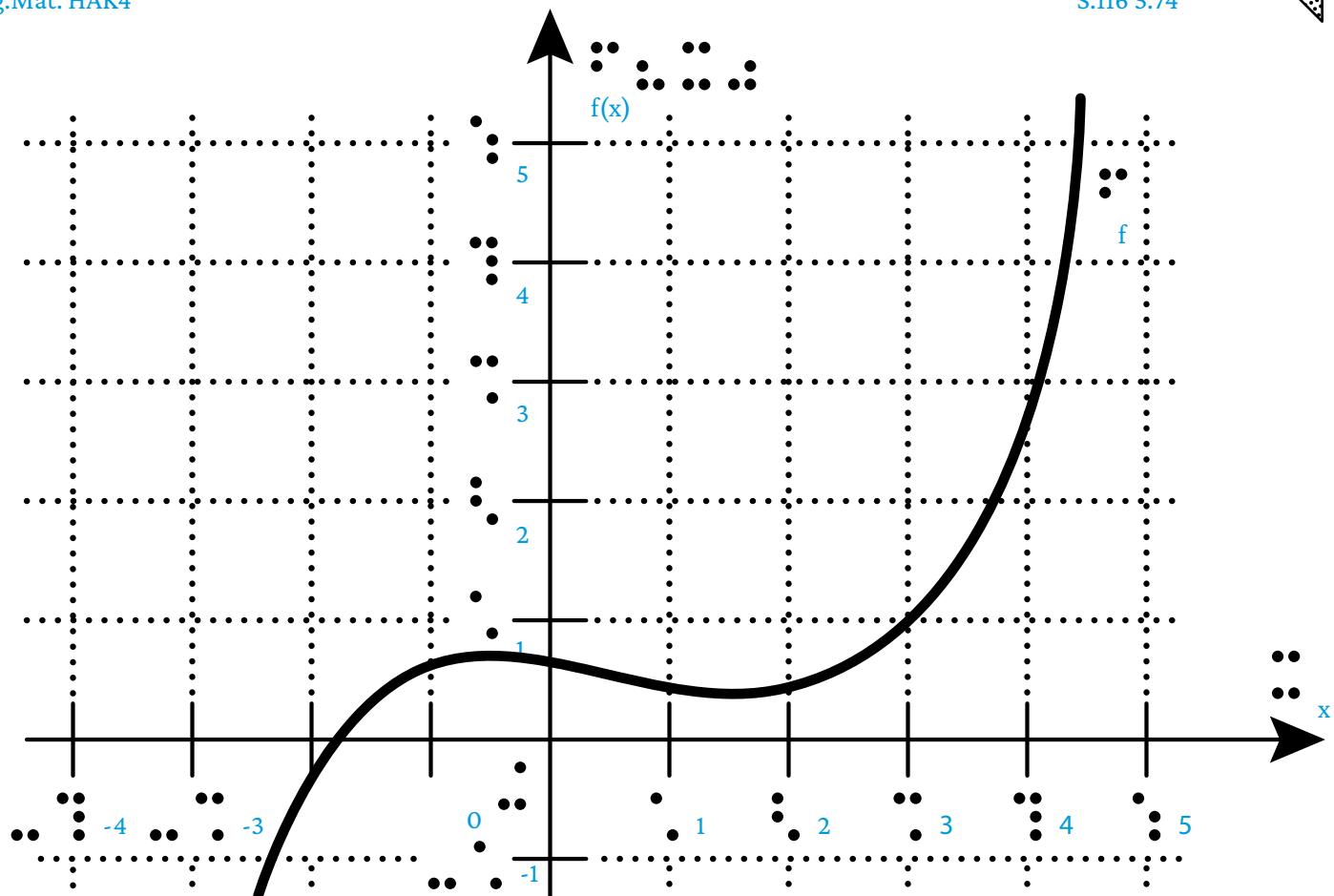
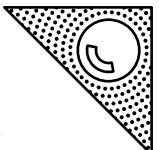
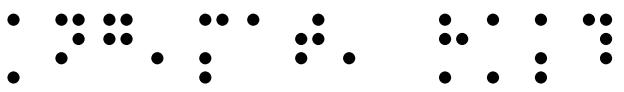


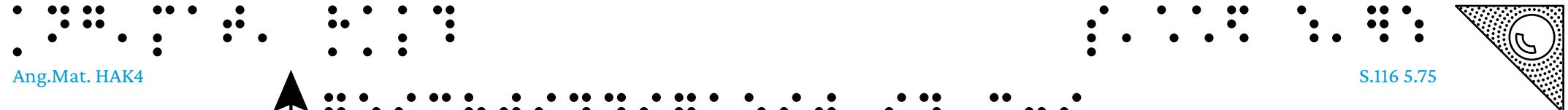
Ang. Mat. HAK4



f^{-*}(b-a) = int[a; b](f(x) 'dx)

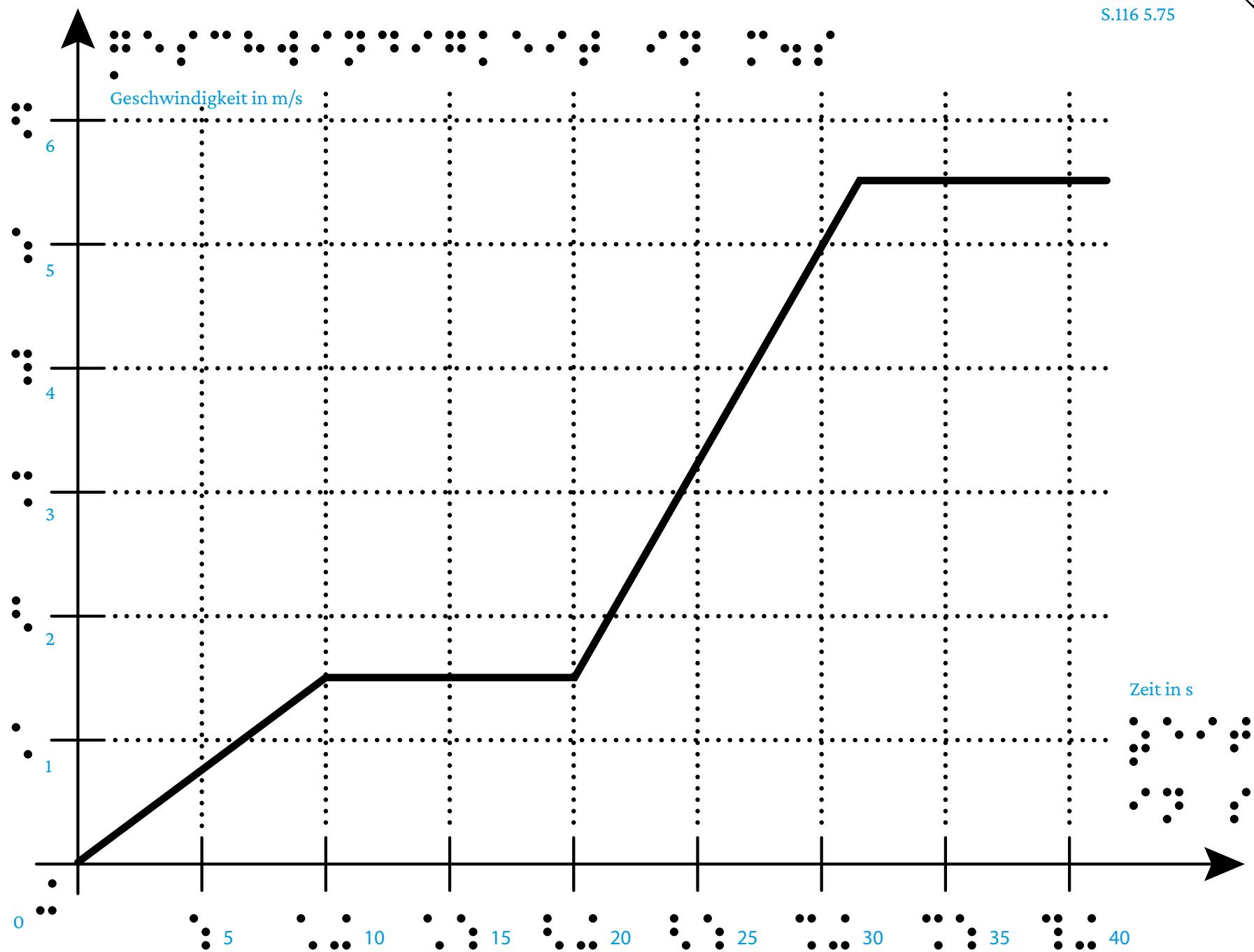


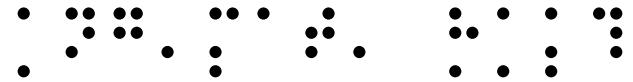




Ang.Mat. HAK4

S.116 5.75

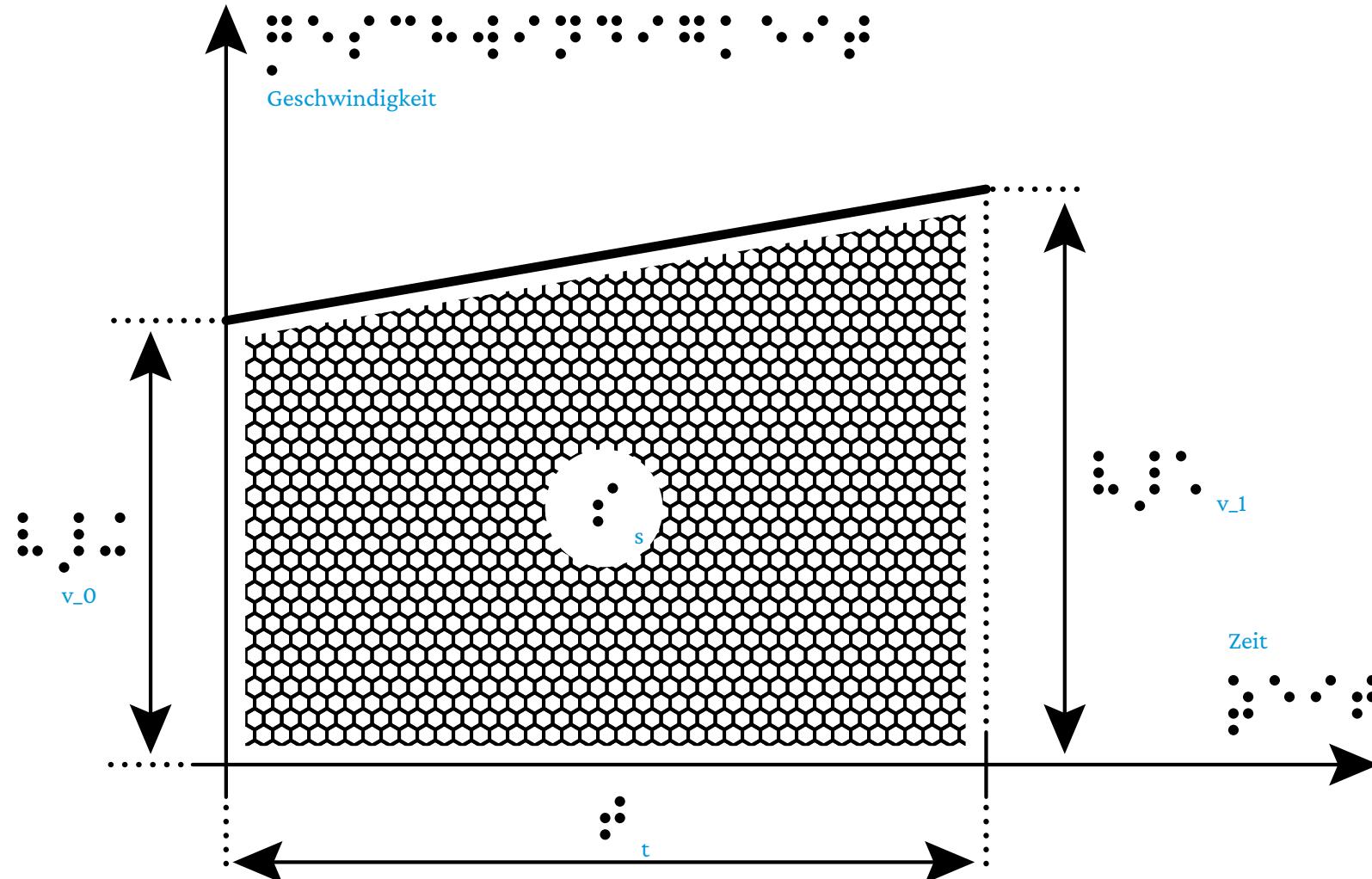
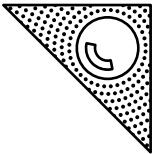


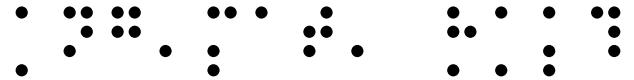


Ang. Mat. HAK4



S.116 5.75 d)

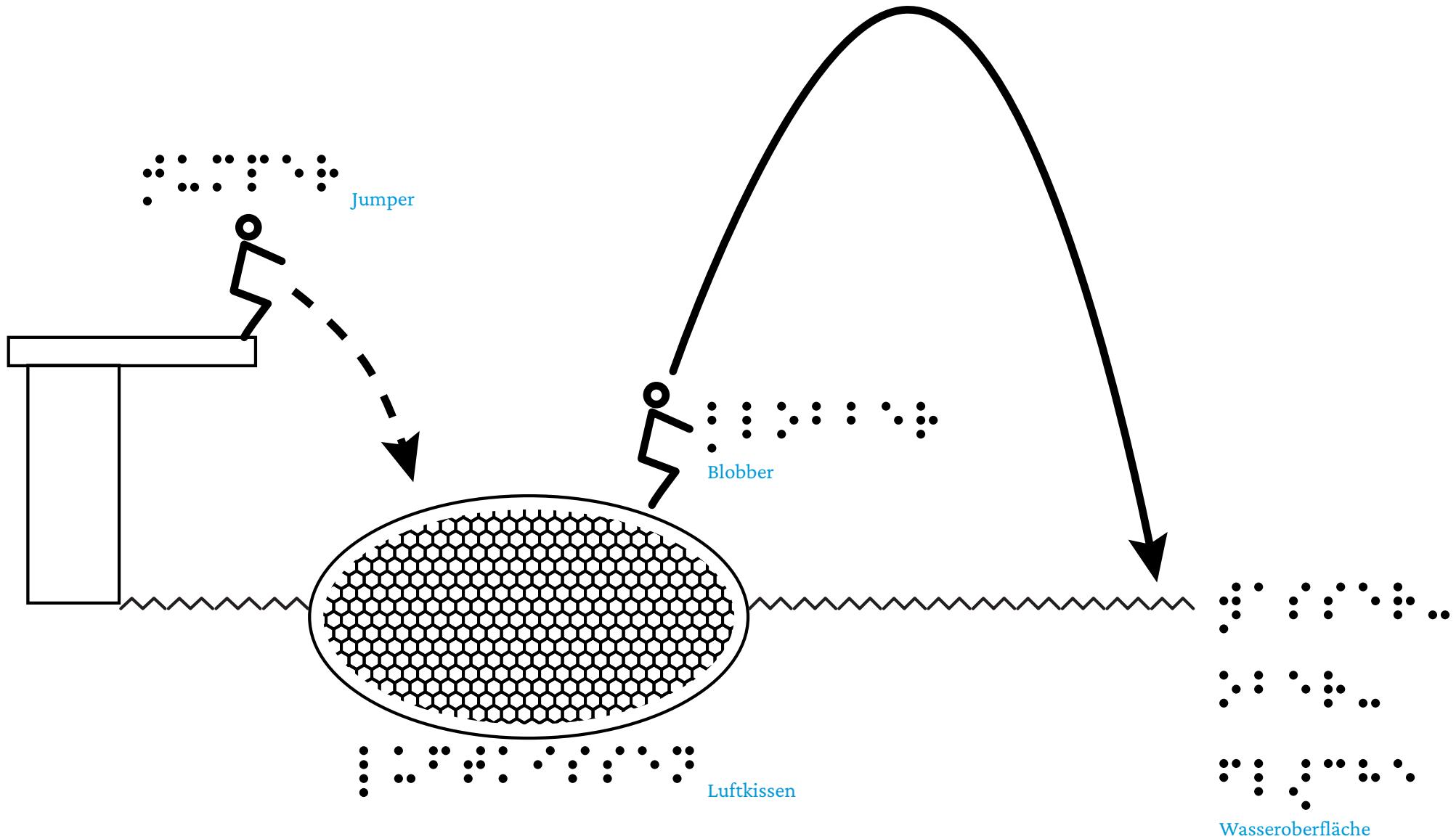
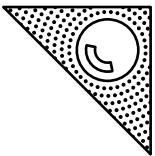




Ang. Mat. HAK4

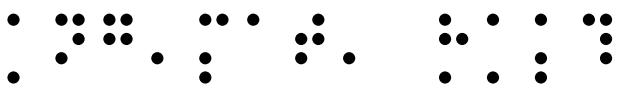


S.116 5.76

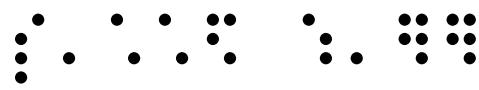


Luftkissen

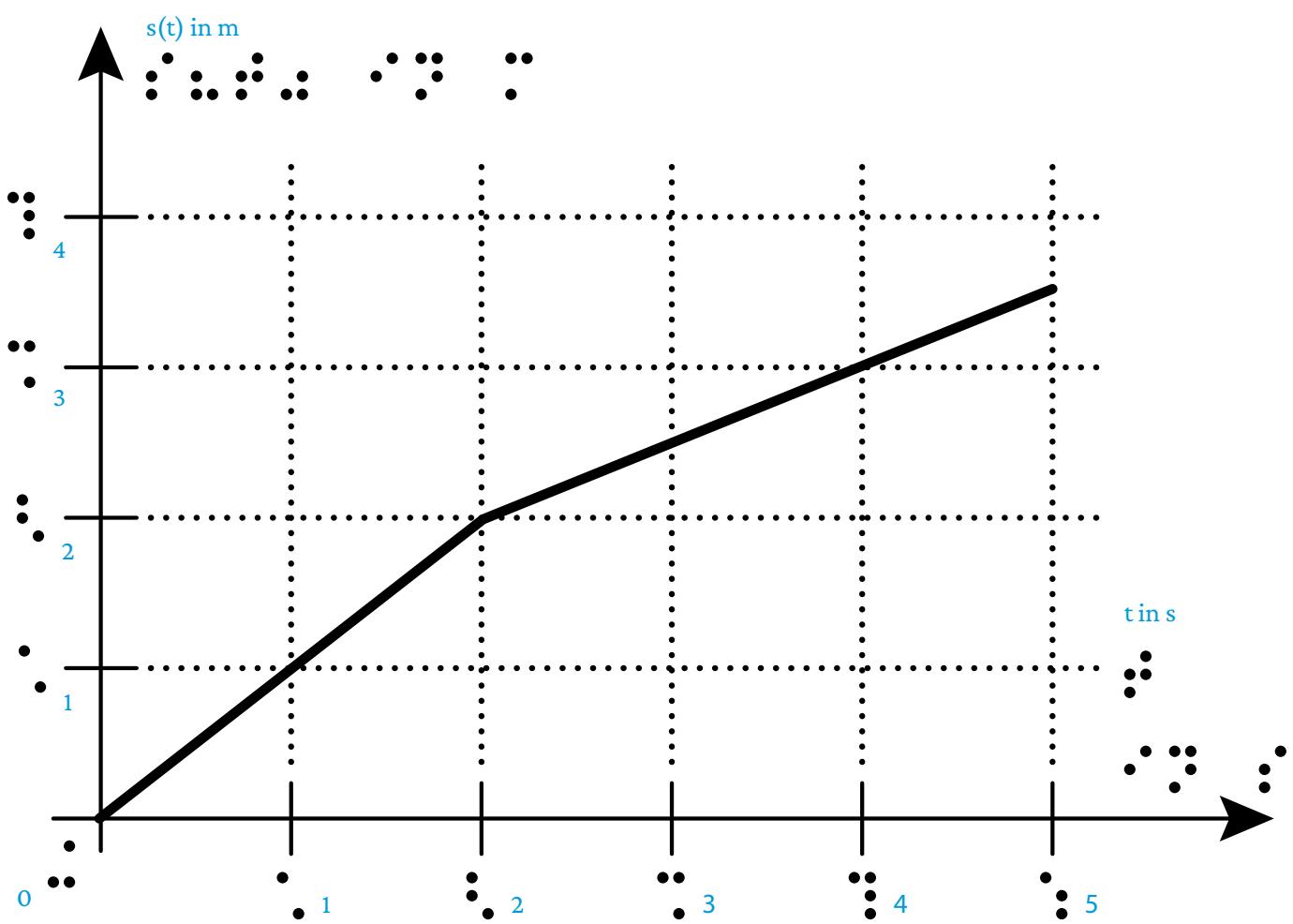
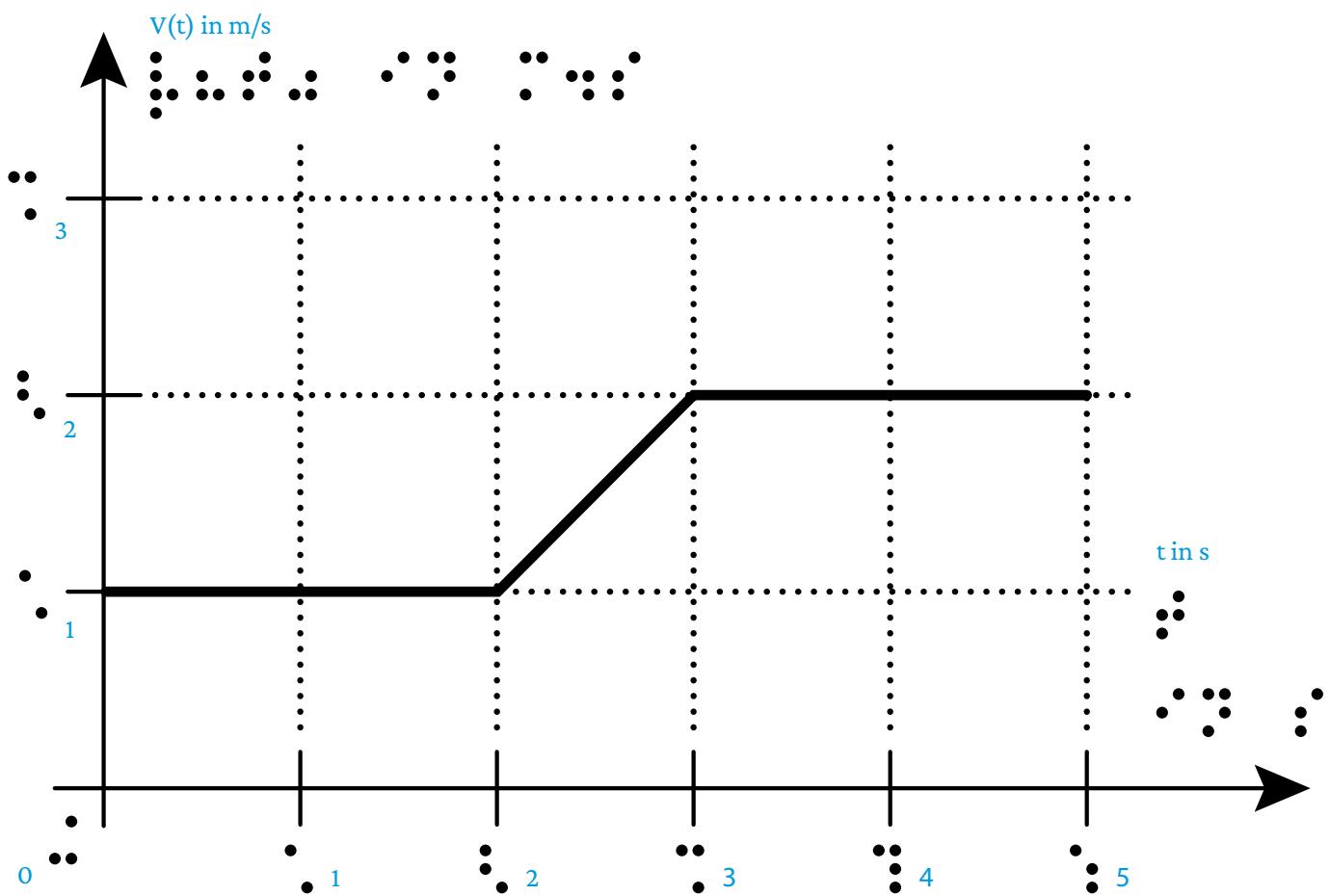
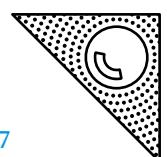
Wasseroberfläche

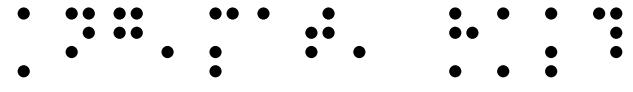


Ang. Mat. HAK4



S.116 5.77

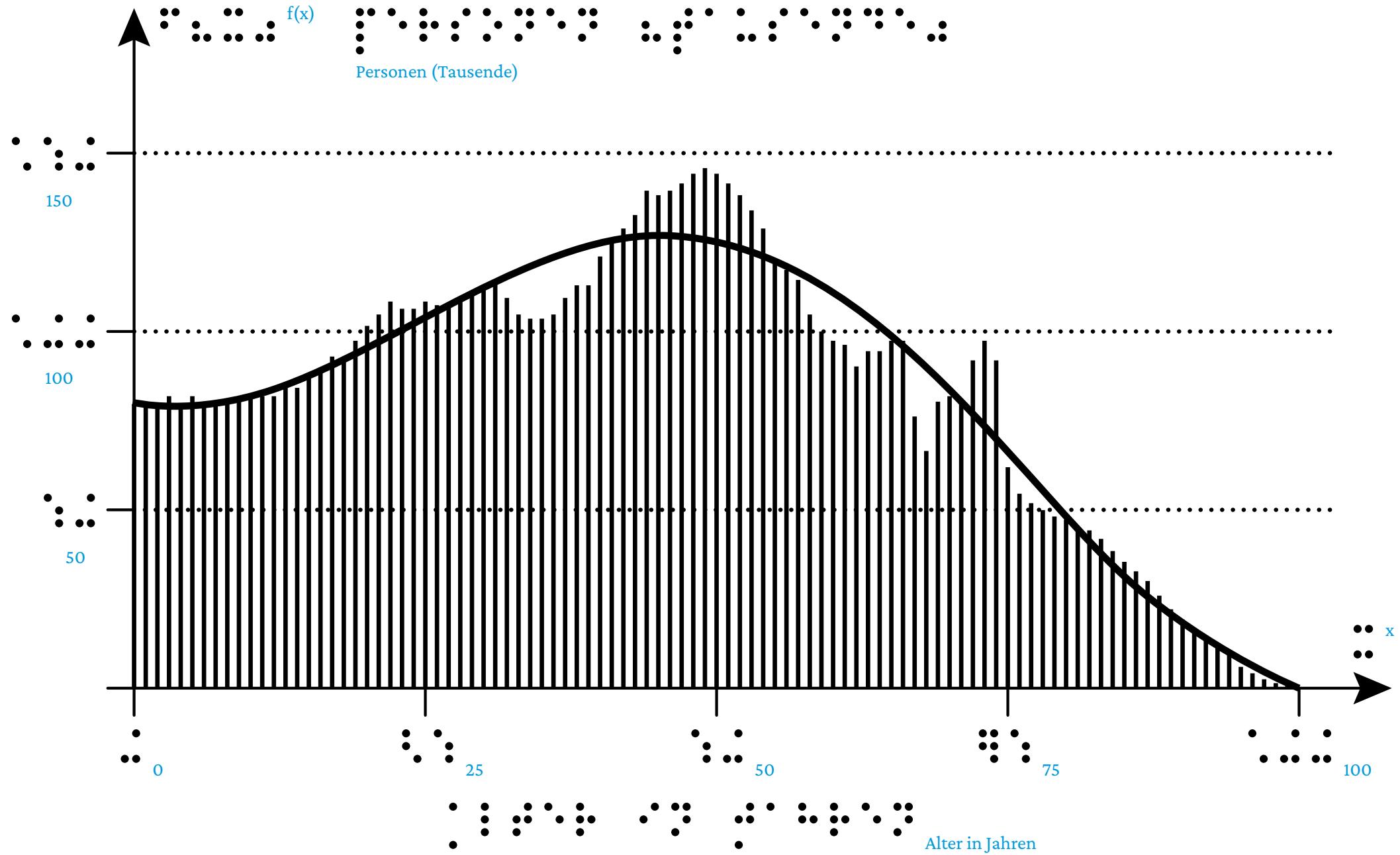


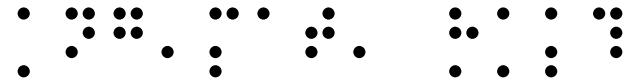


Ang. Mat. HAK4



S.117 5.78

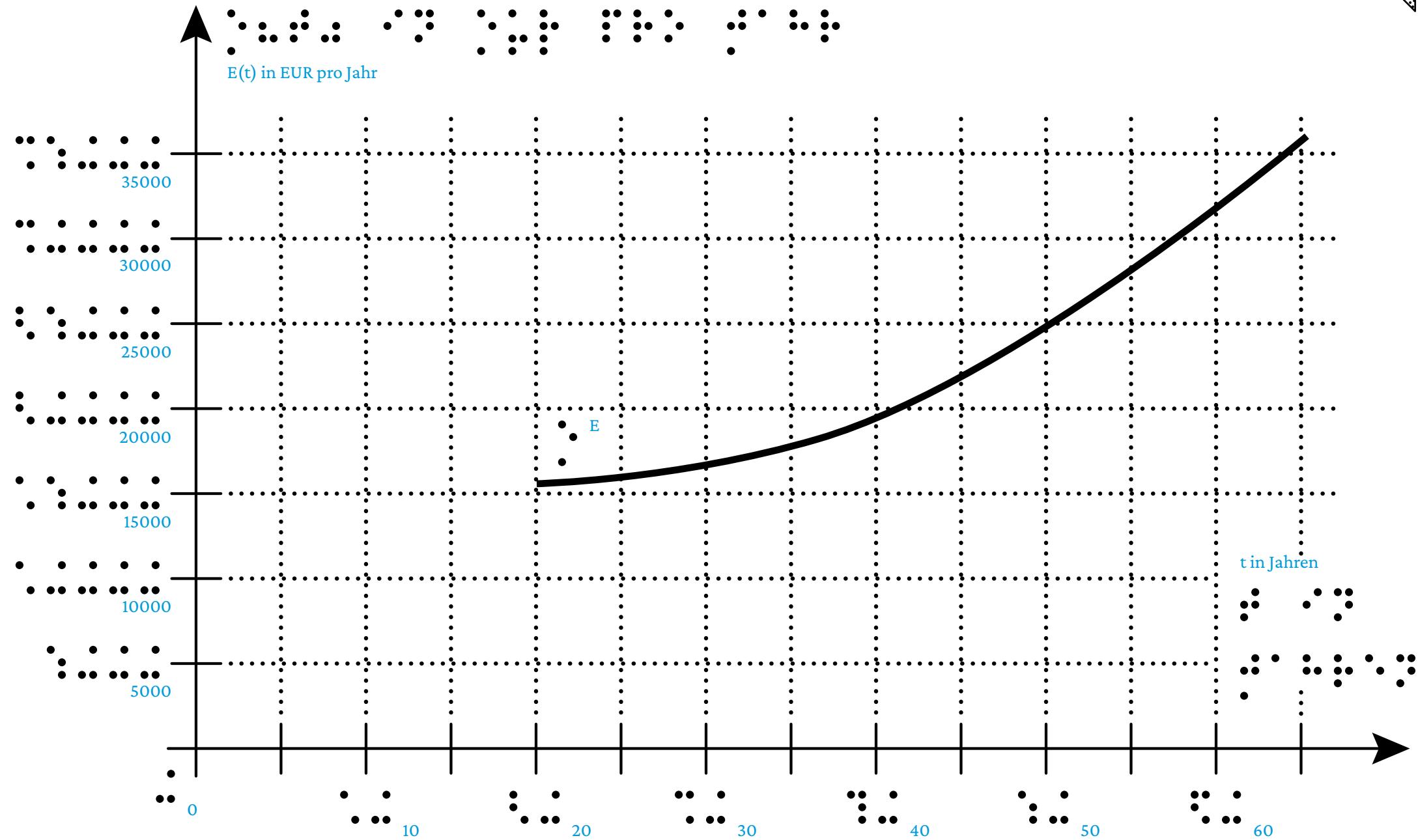


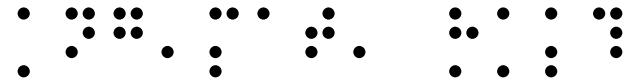


Ang. Mat. HAK4

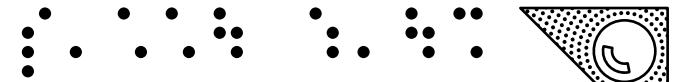


S.117 5.79

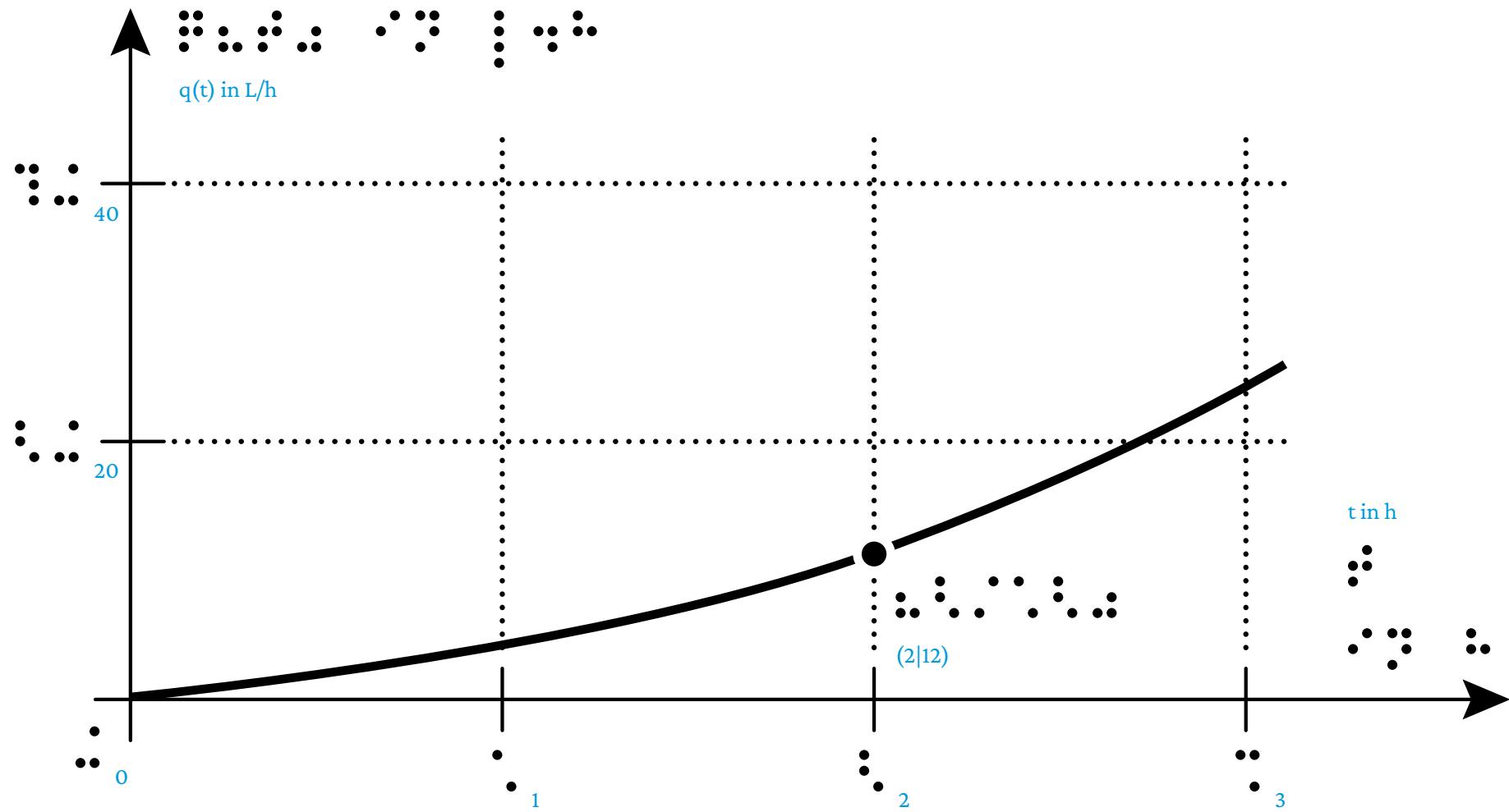
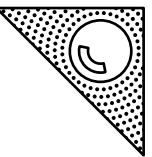




Ang.Mat. HAK4

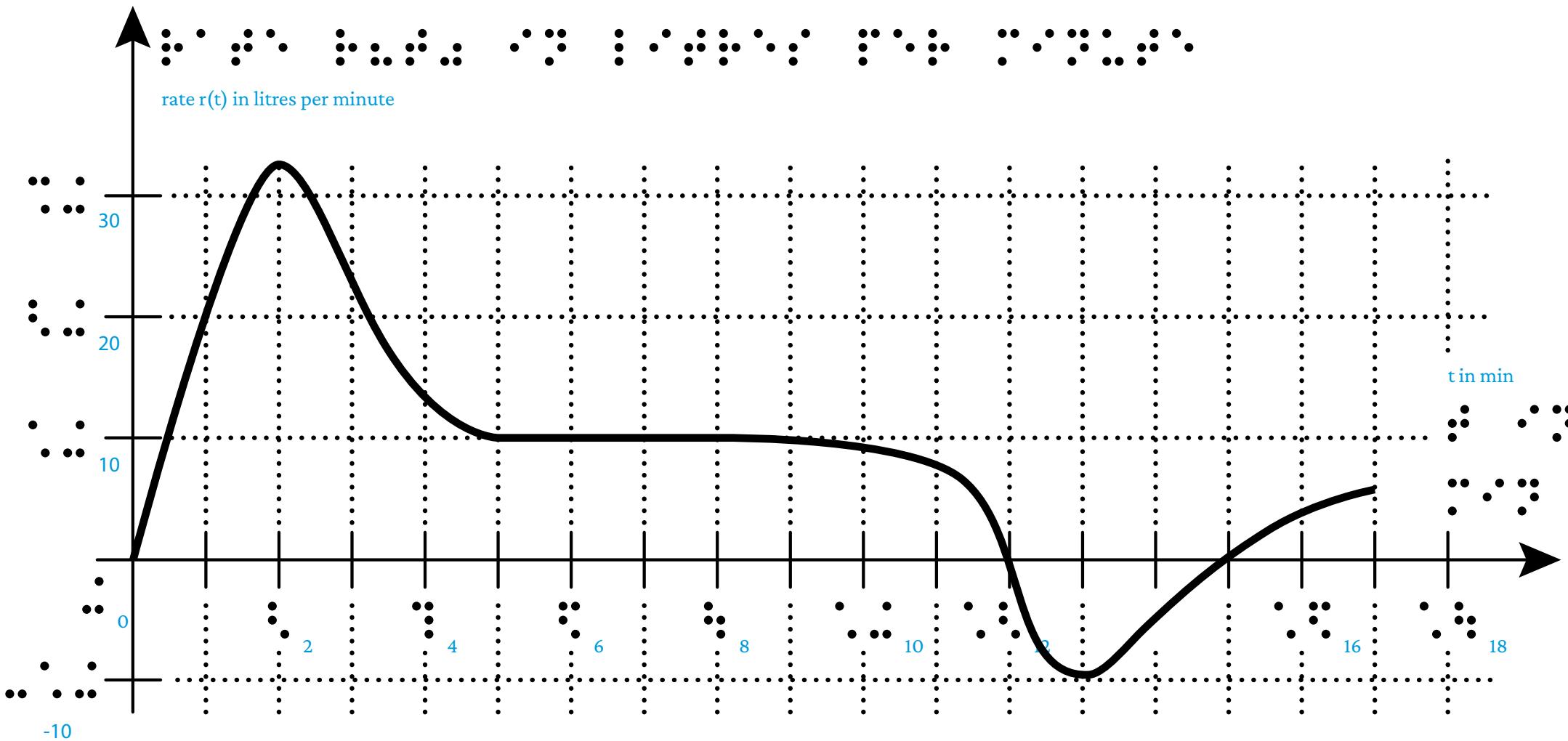
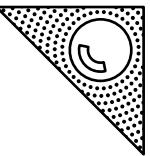


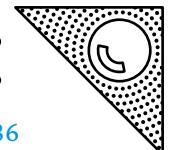
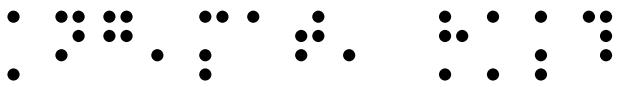
S.118 5.83



Ang. Mat. HAK4

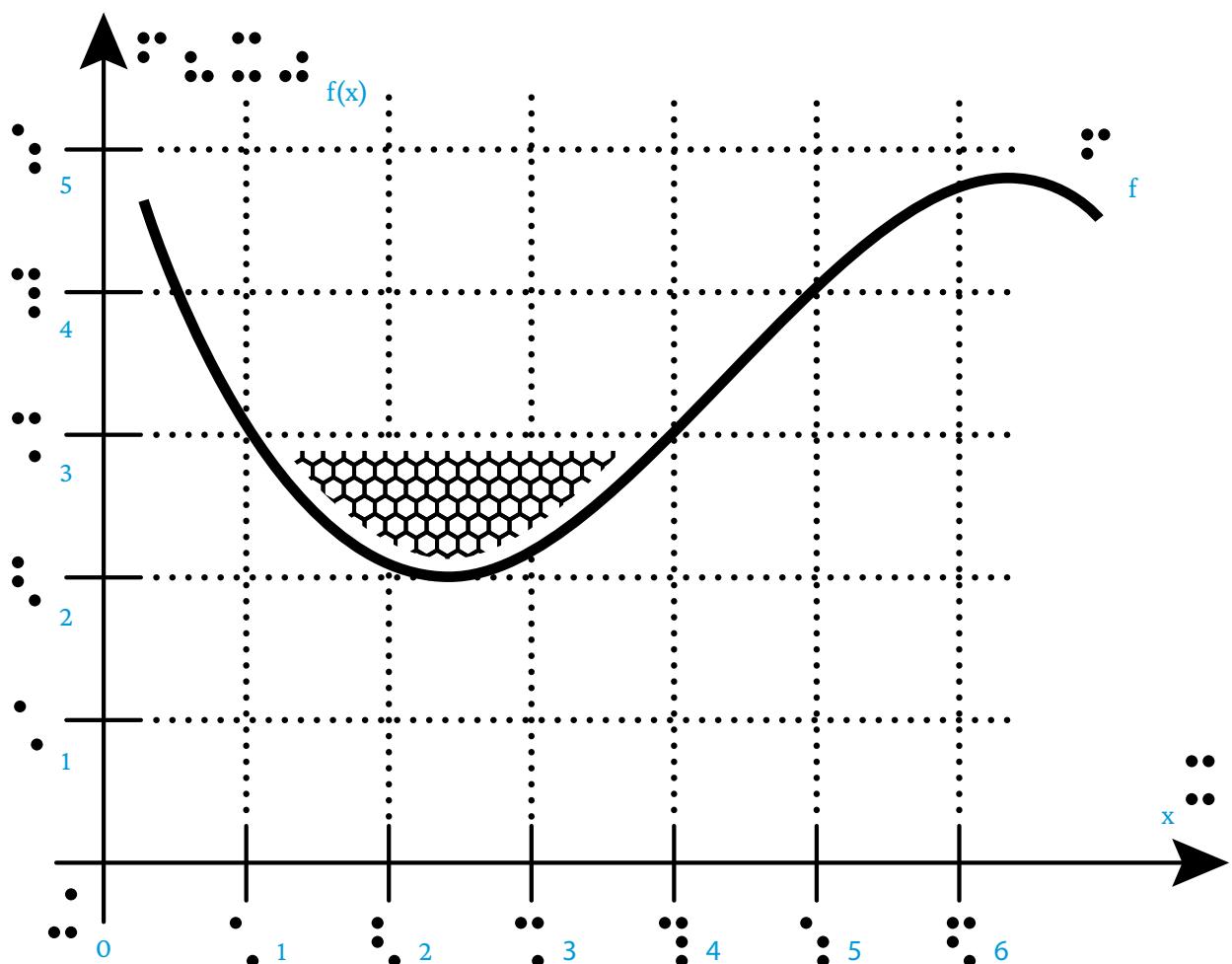
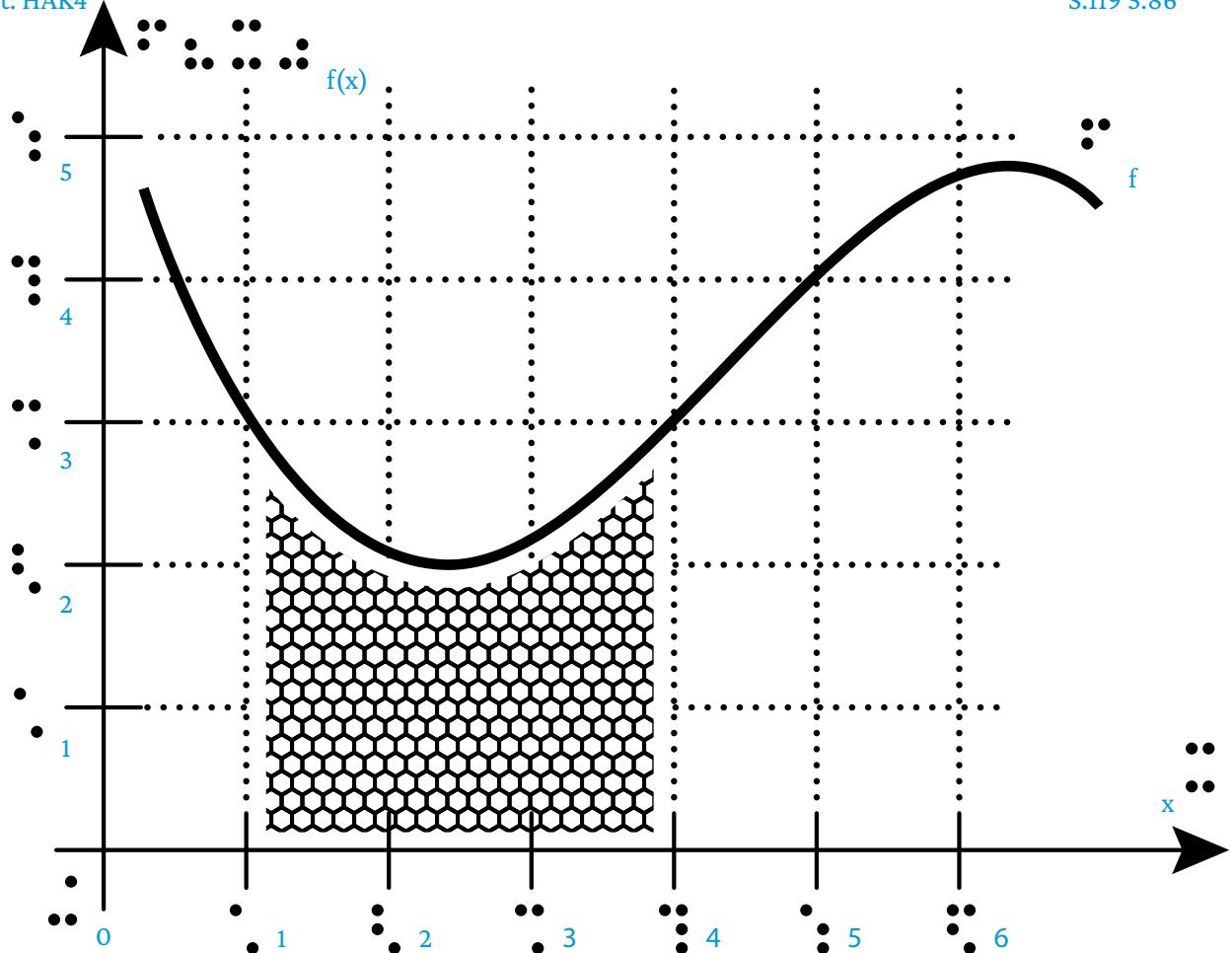
S.118 5.84

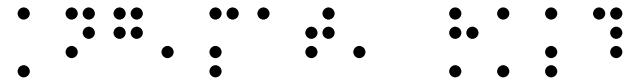




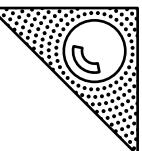
Ang. Mat. HAK4

S.119 5.86



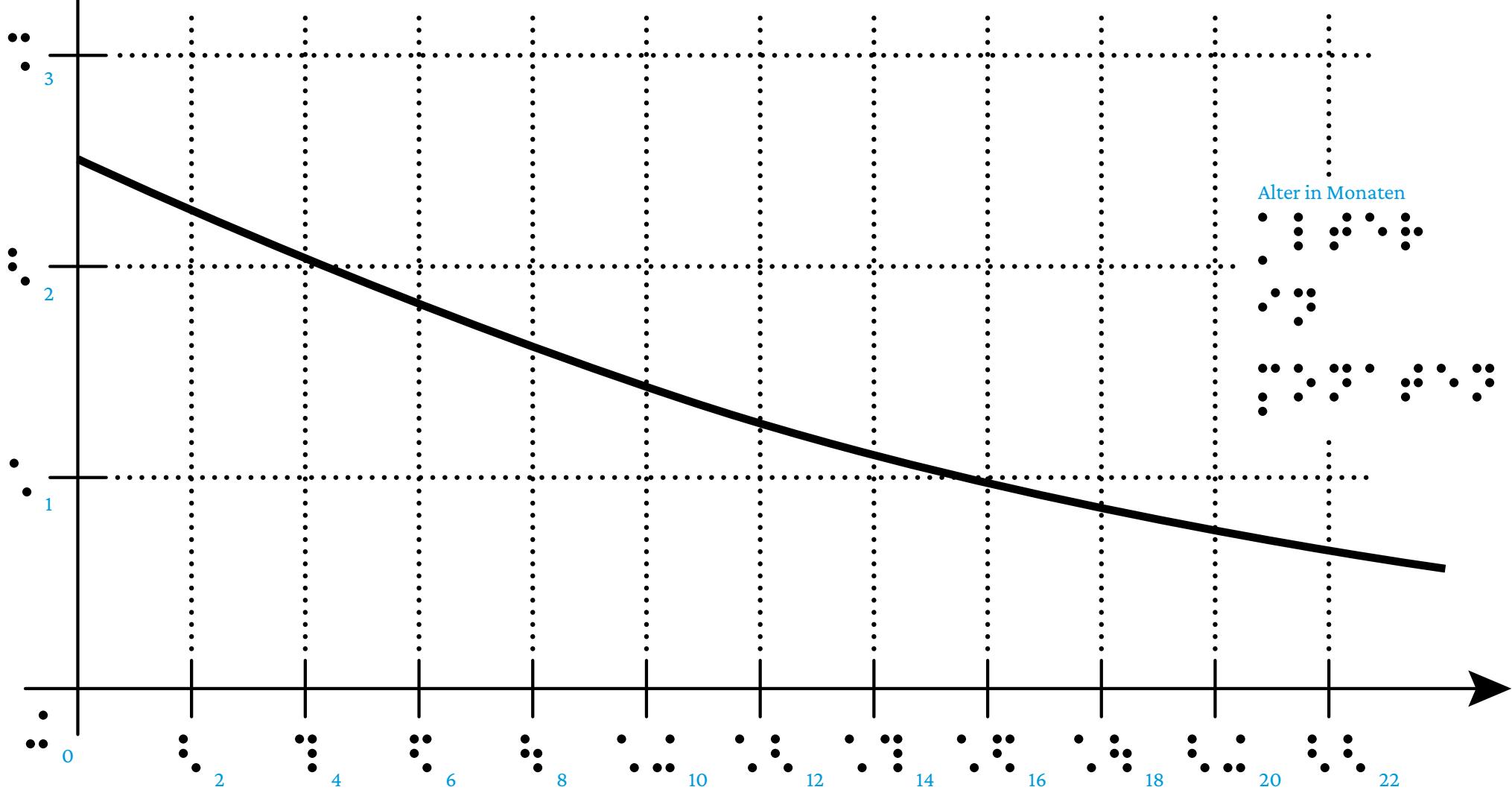


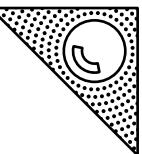
Ang. Mat. HAK4



S.119 5.88

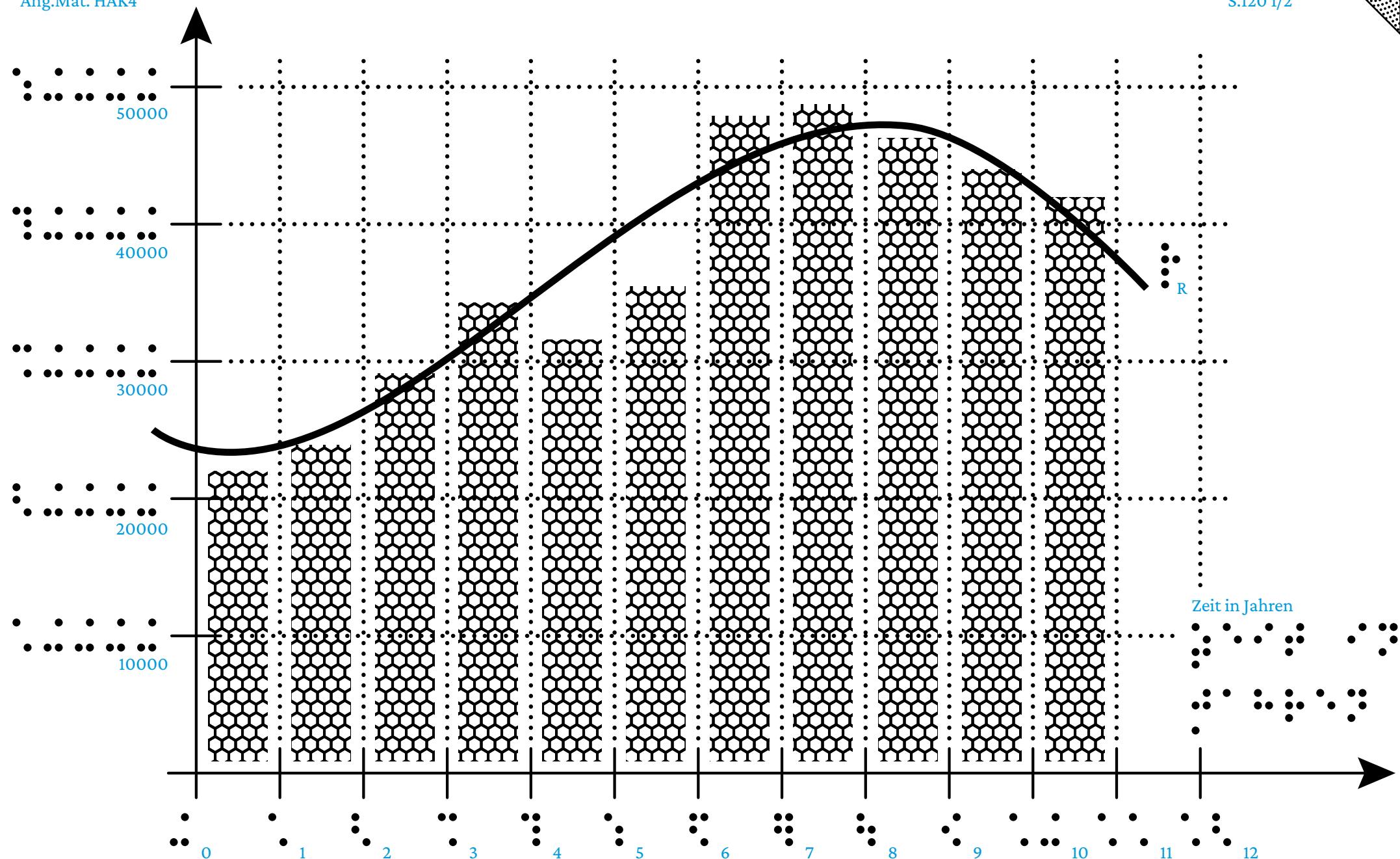
momentane Änderungsrate der Länge in cm pro Monat

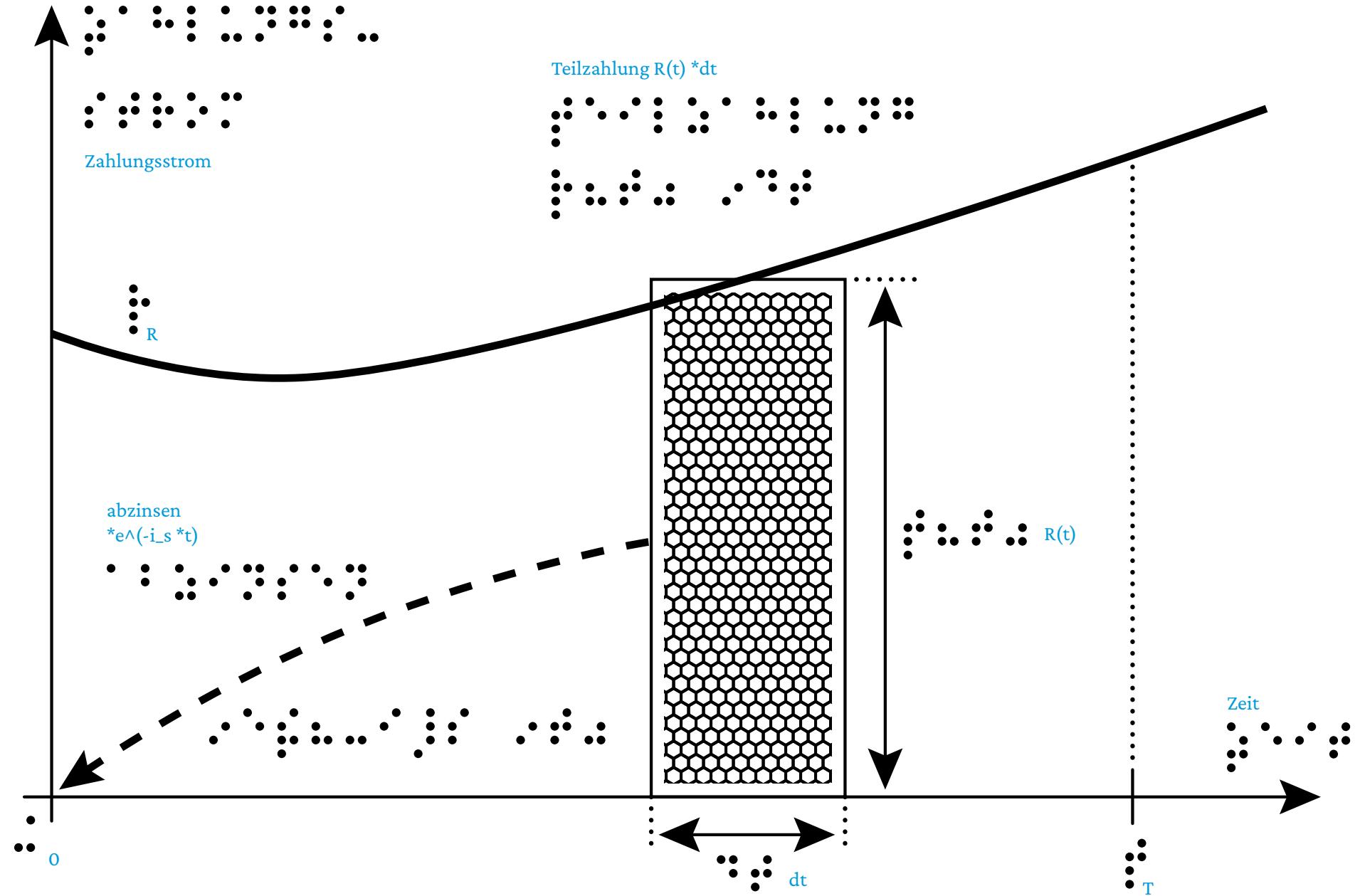
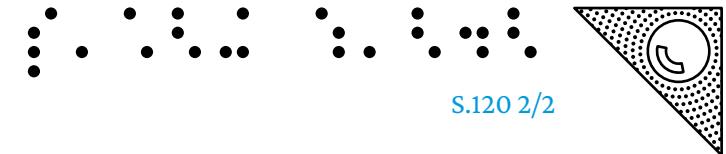
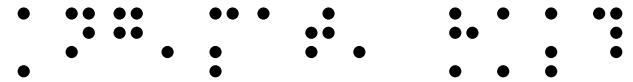


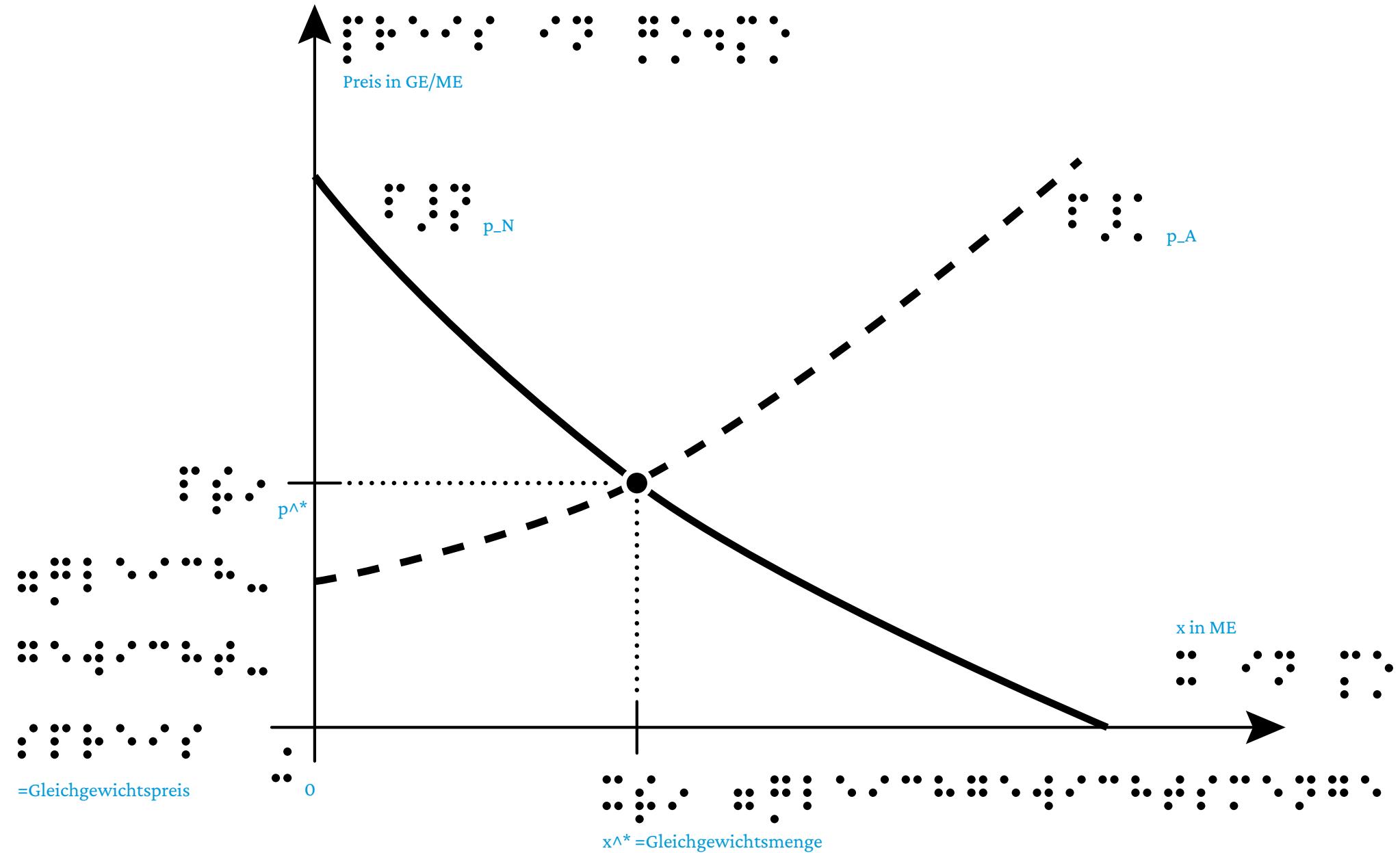
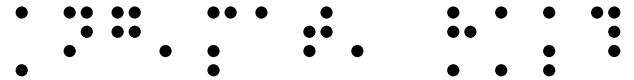


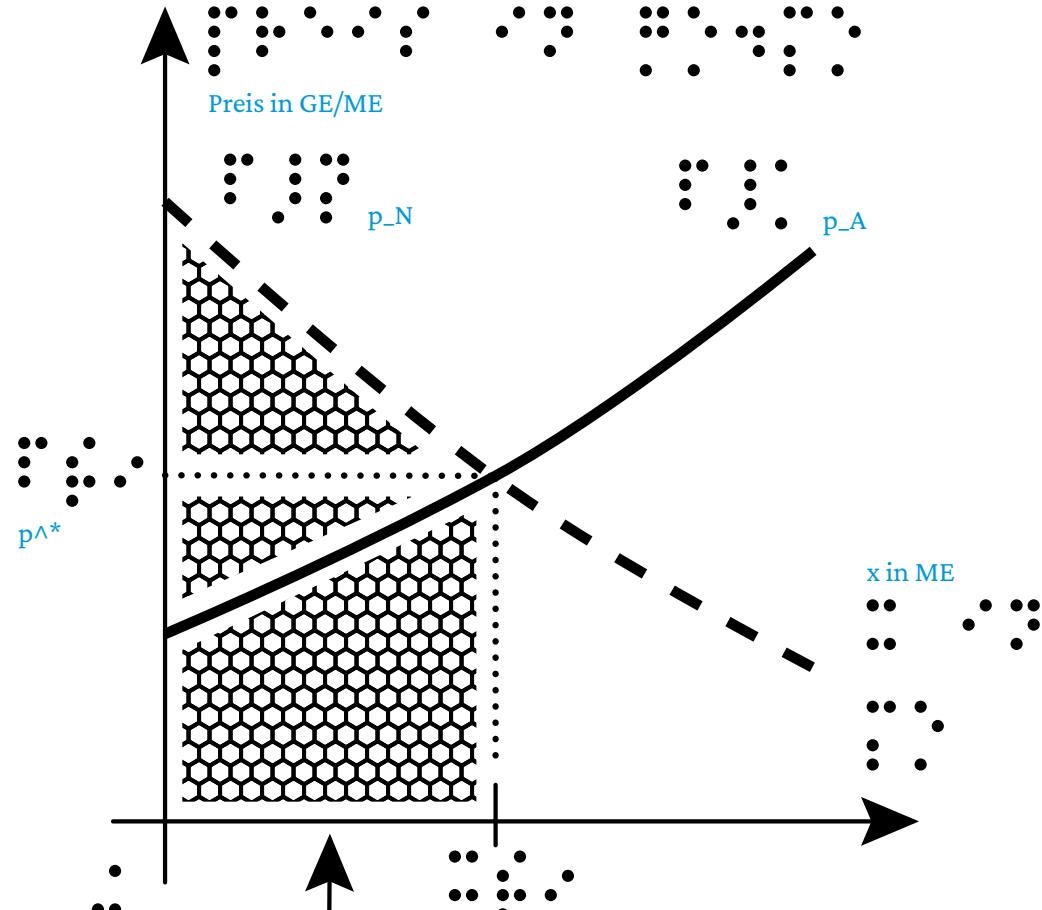
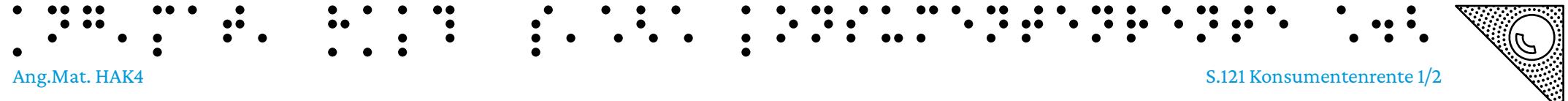
Ang. Mat. HAK4

S.120 1/2

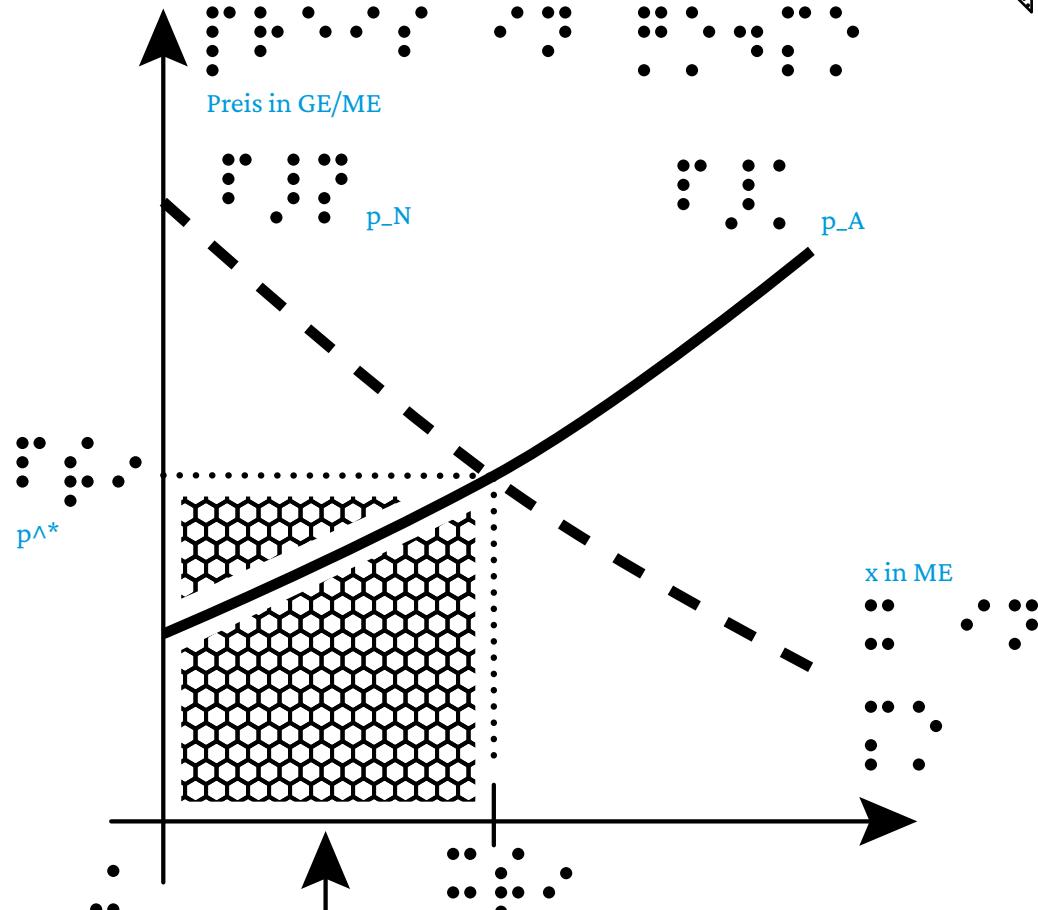




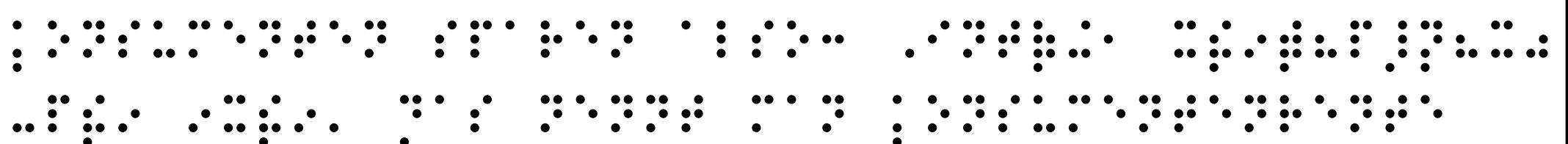
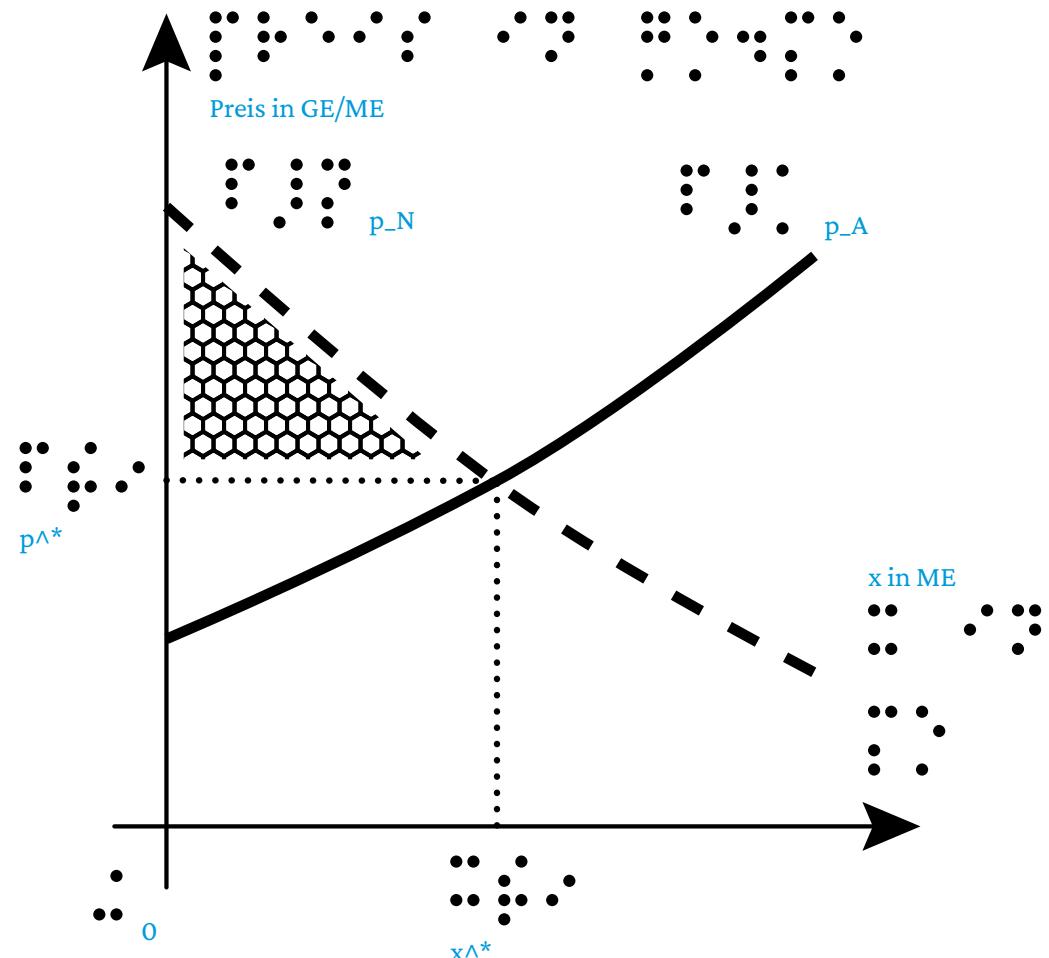
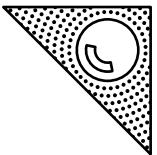
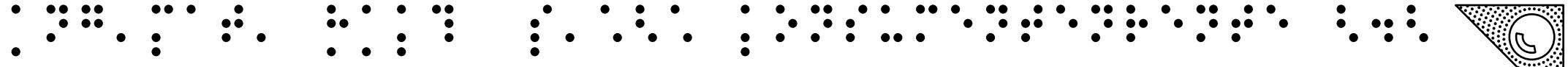




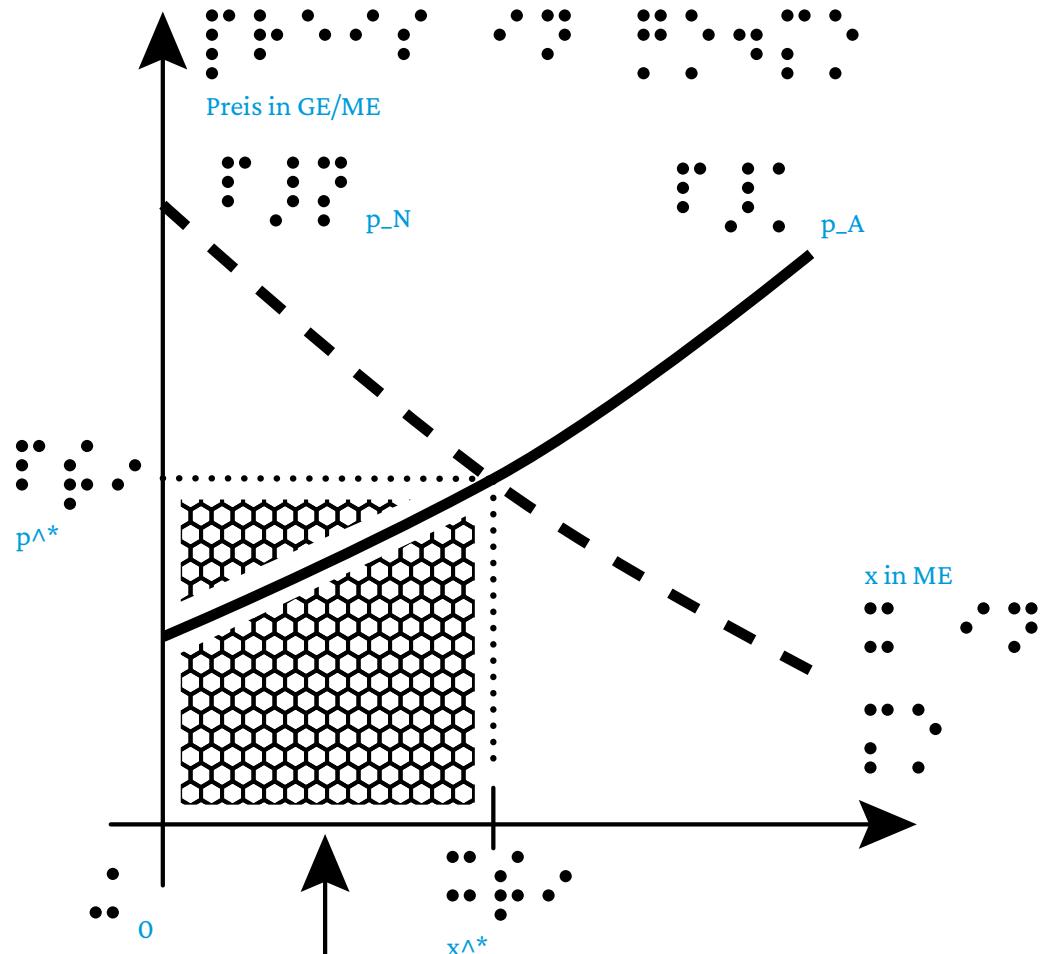
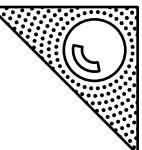
Konsumenten sind bereit $\int[0, x^*] (p_N(x) \, dx)$ zu zahlen



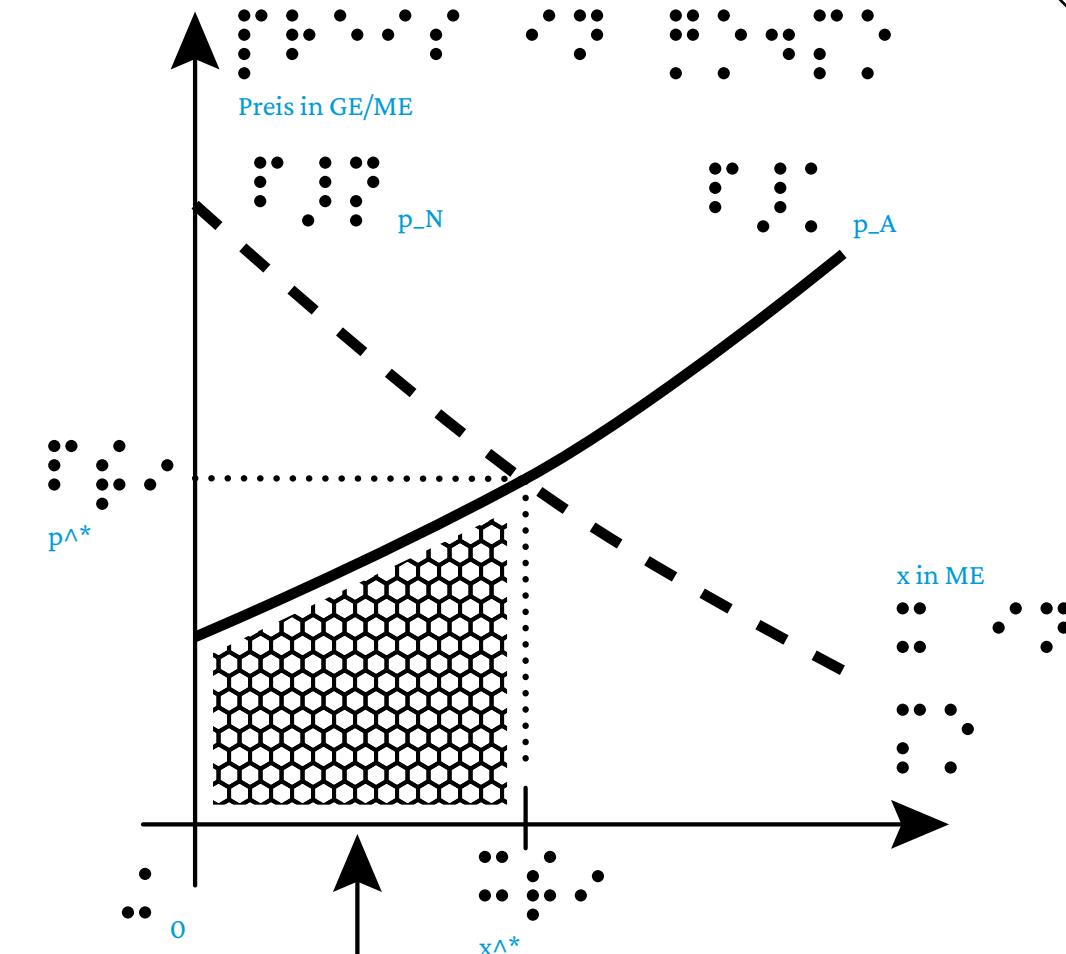
Tatsächlich zahlen sie aber nur $p^* \cdot x^*$



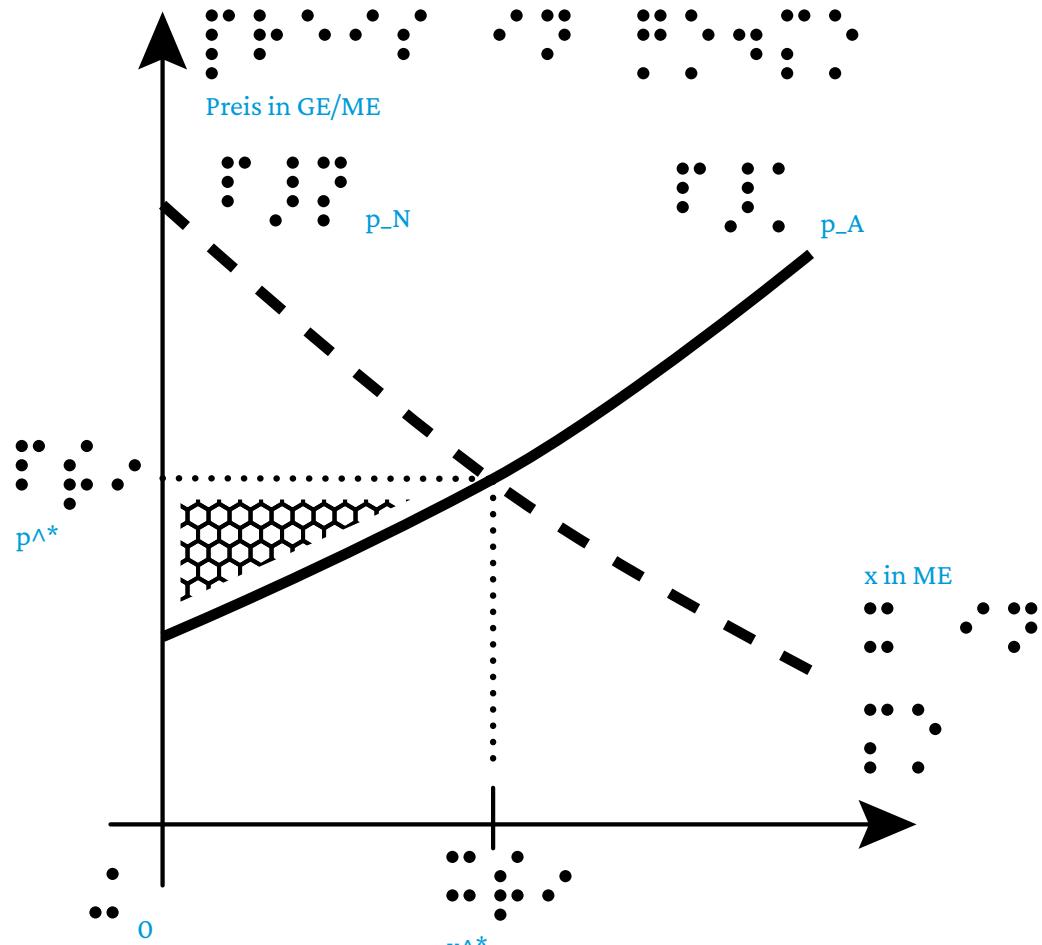
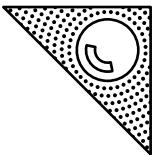
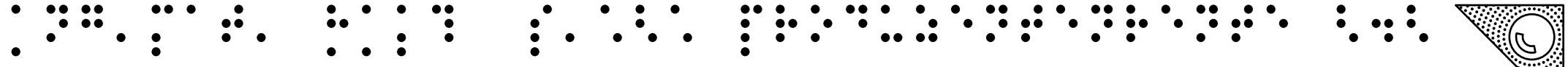
Konsumenten sparen also: $\int[0, x^*](p_N(x) - p^*) \cdot x^* dx$. Das nennt man Konsumentenrente



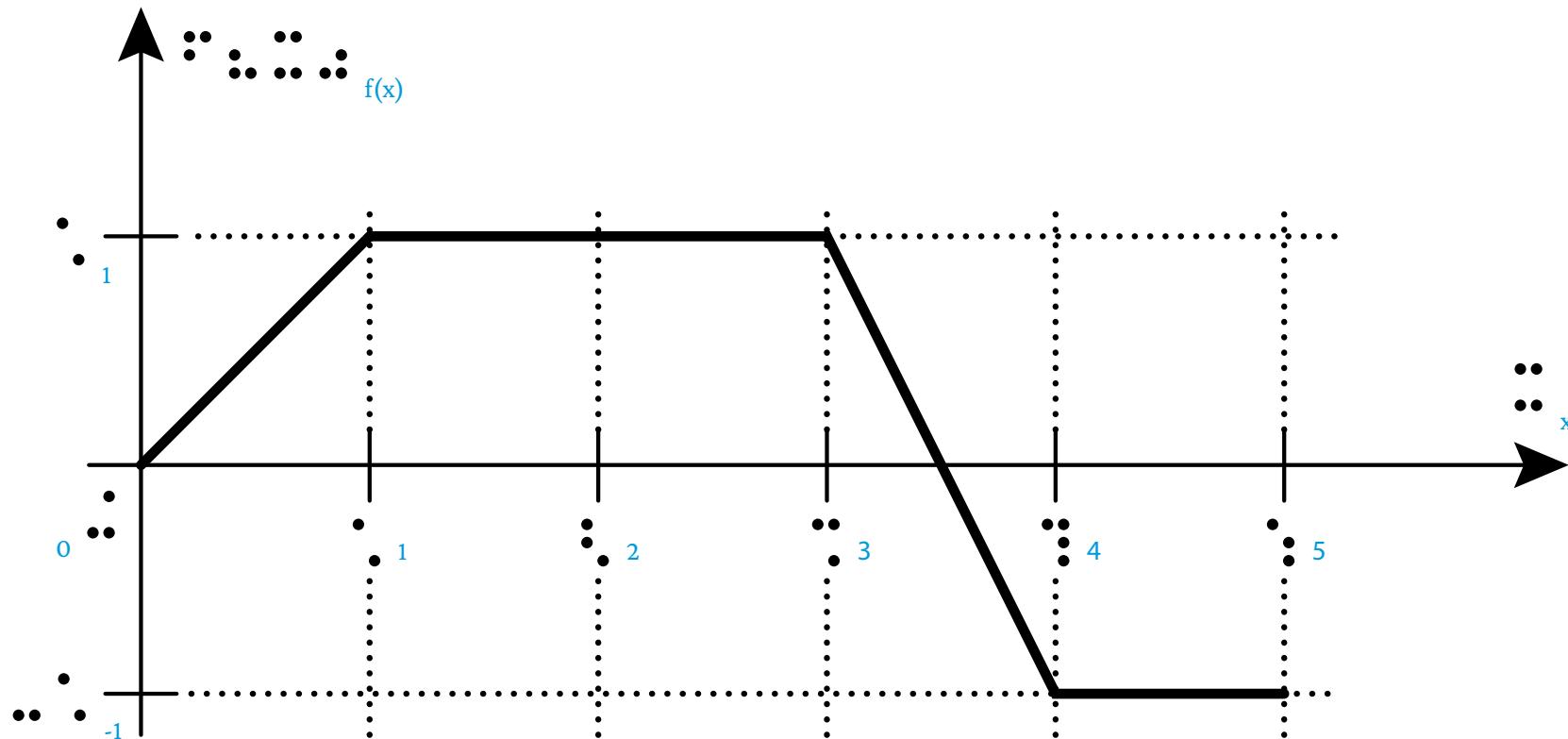
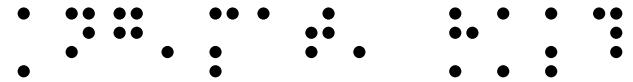
Produzenten erzielen einen Erlös von $p^* * x^*$

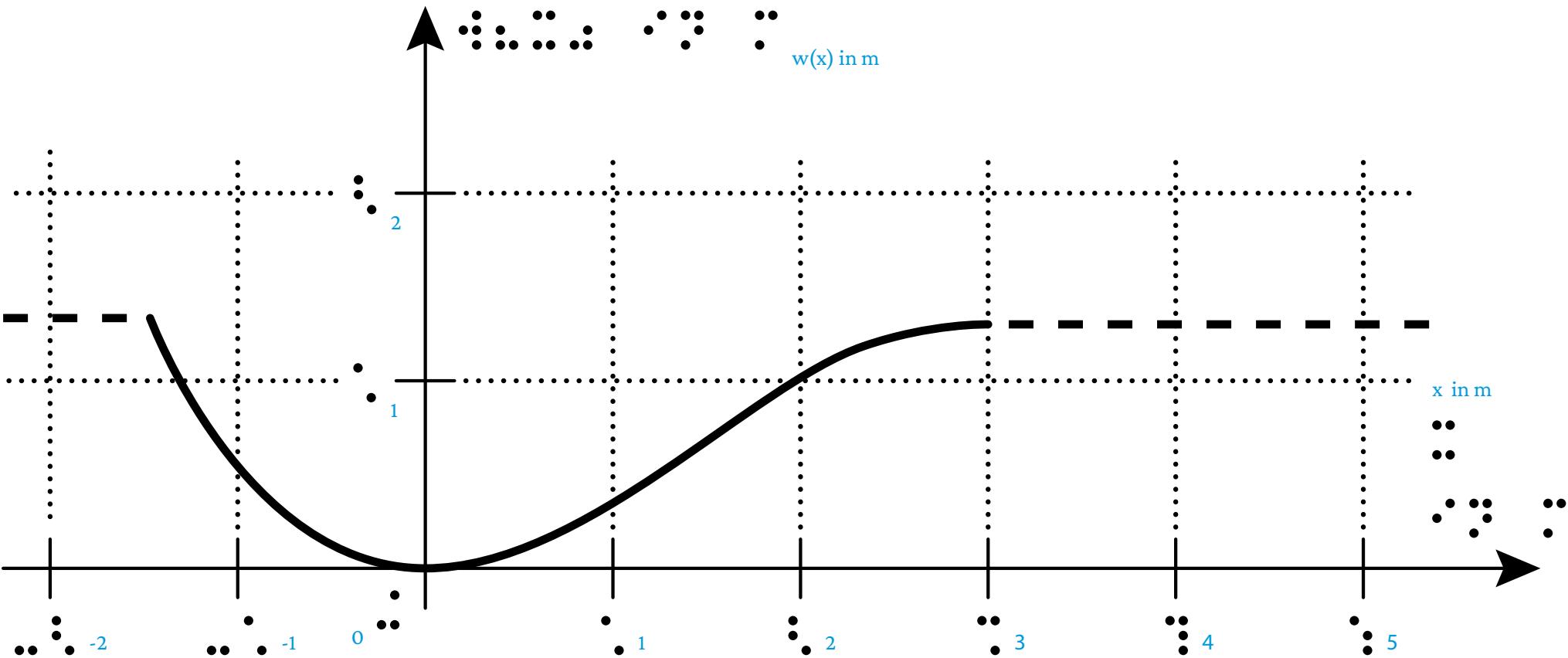
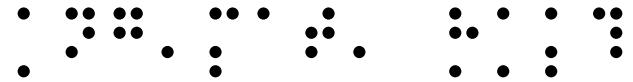


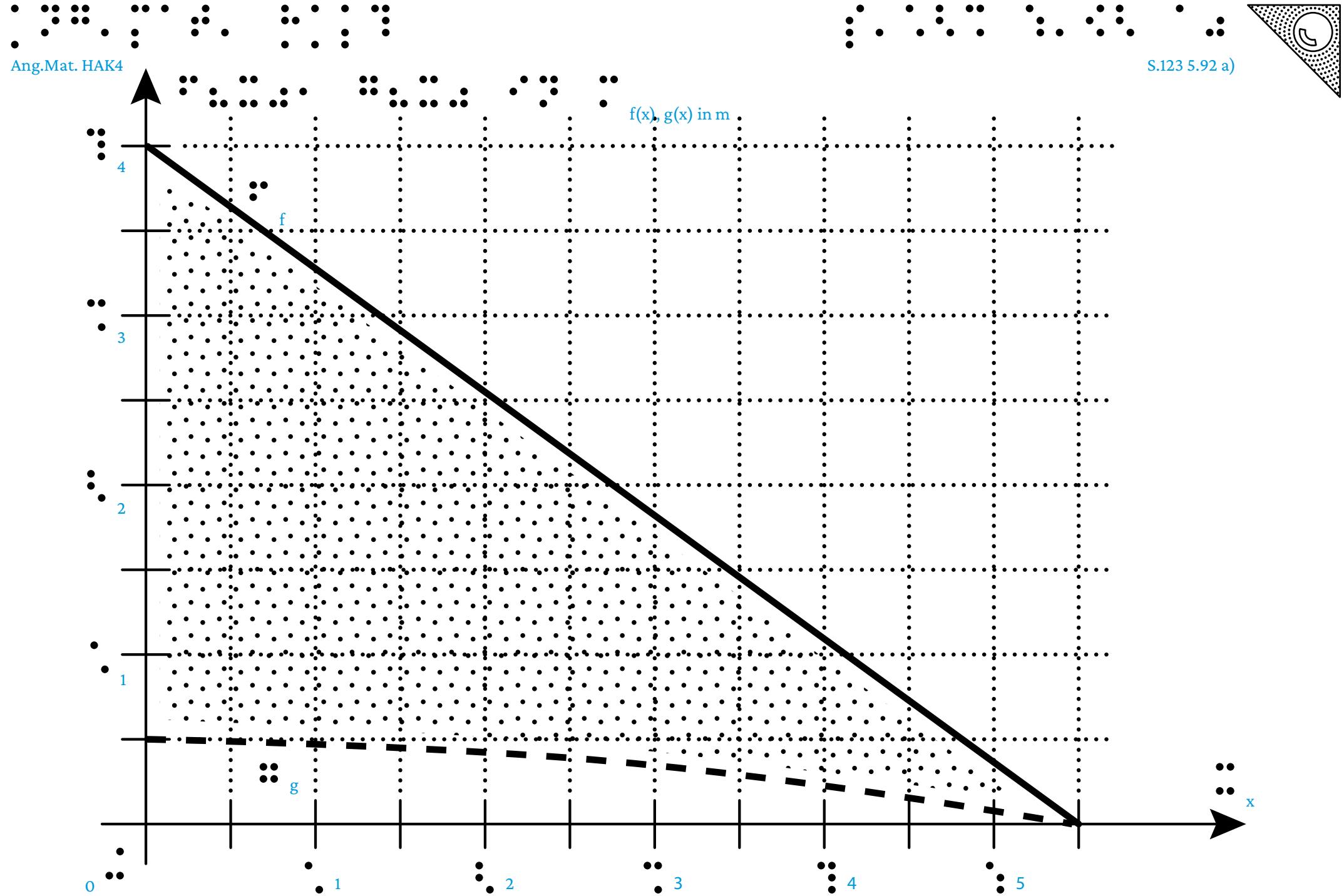
Würden aber Erlös von 'int [0, x^*](p_N(x) 'dx) akzeptieren

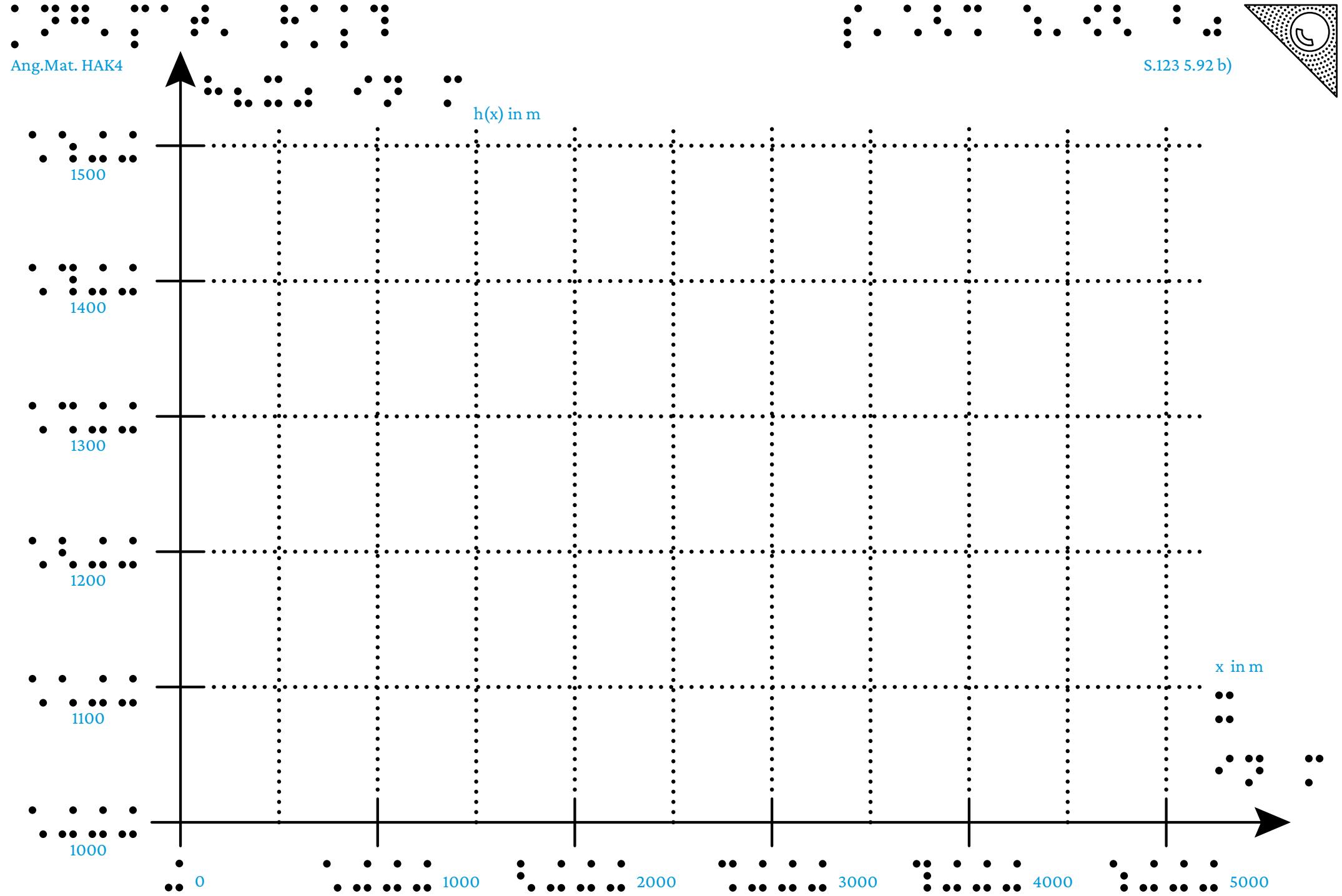


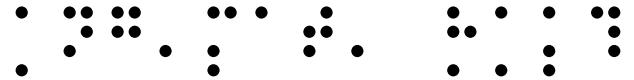
Produzenten haben somit $p^* * x^* - \int[0, x^*] (p_N(x))$ gespart. Das nennt man Produzentenrente.



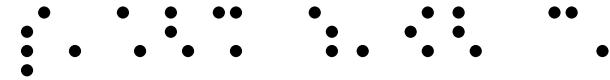




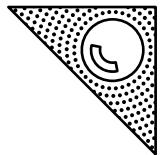




Ang. Mat. HAK4



S.123 5.92 c)



Geschwindigkeit in m/s

17,5

15

12,5

10

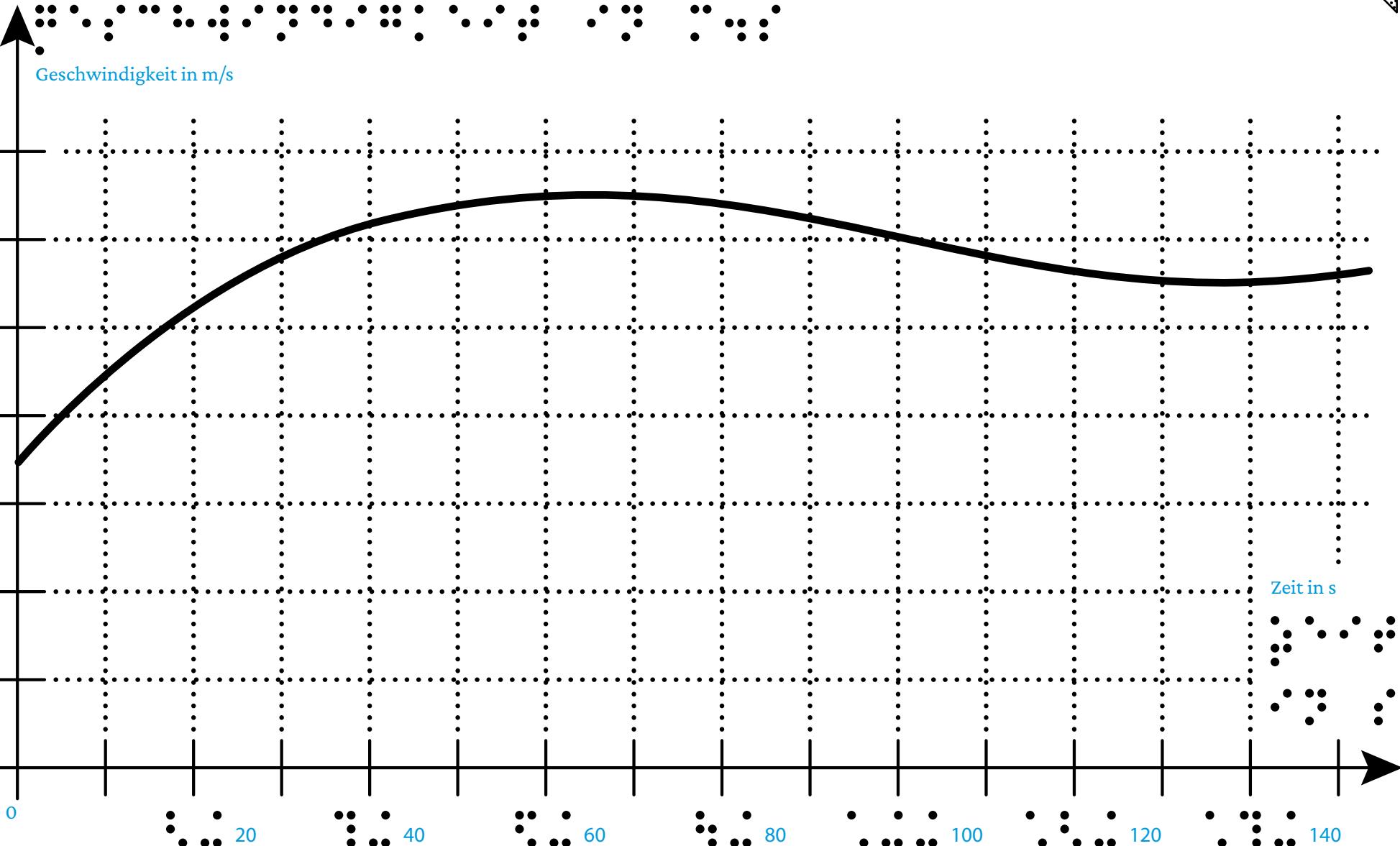
7,5

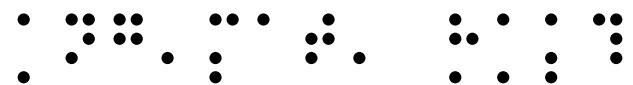
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2,5

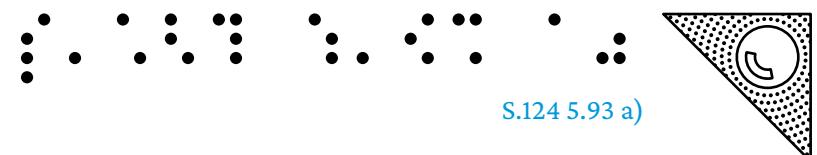
Zeit in s

0 20 40 60 80 100 120 140

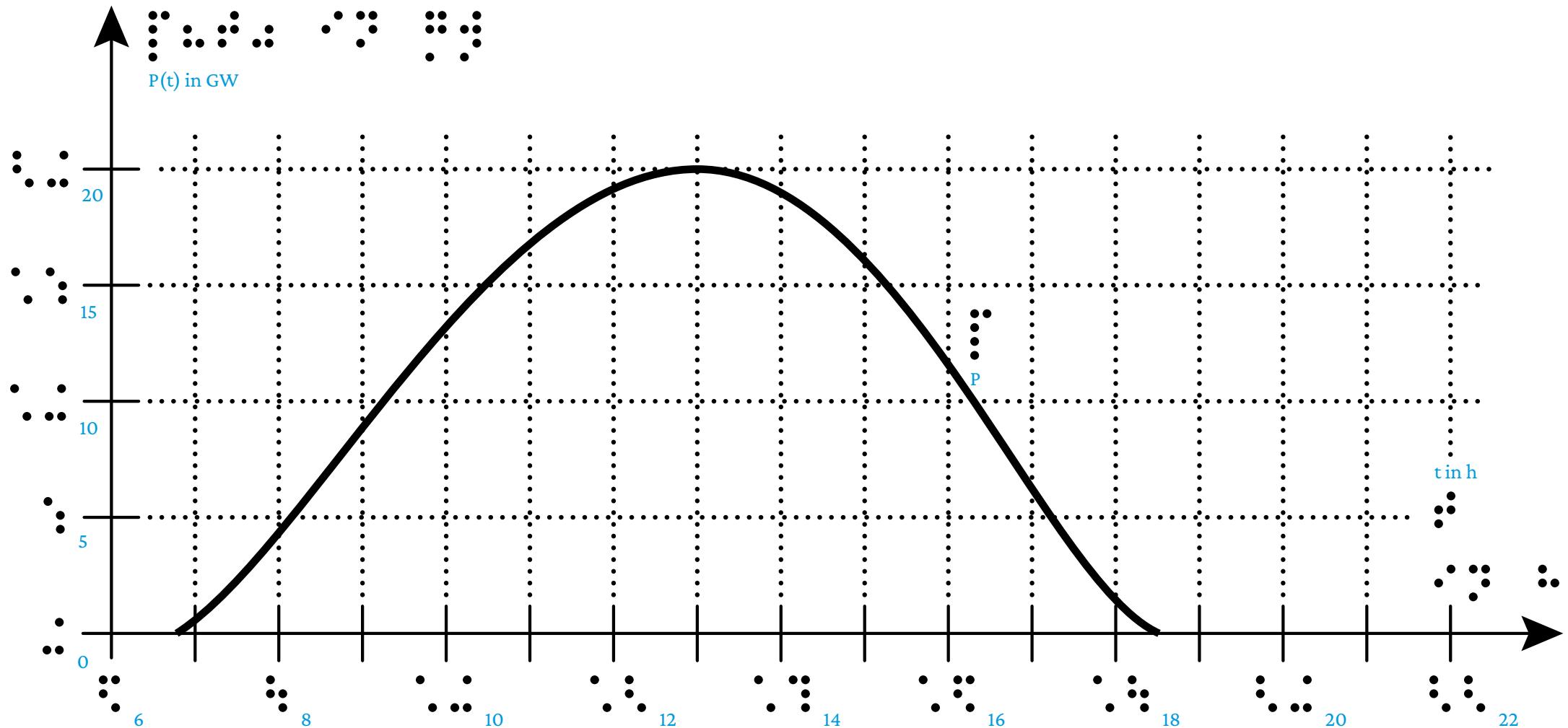
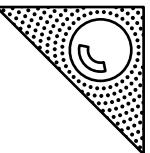


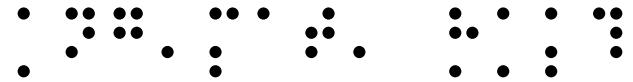


Ang.Mat. HAK4



S.124 5.93 a)

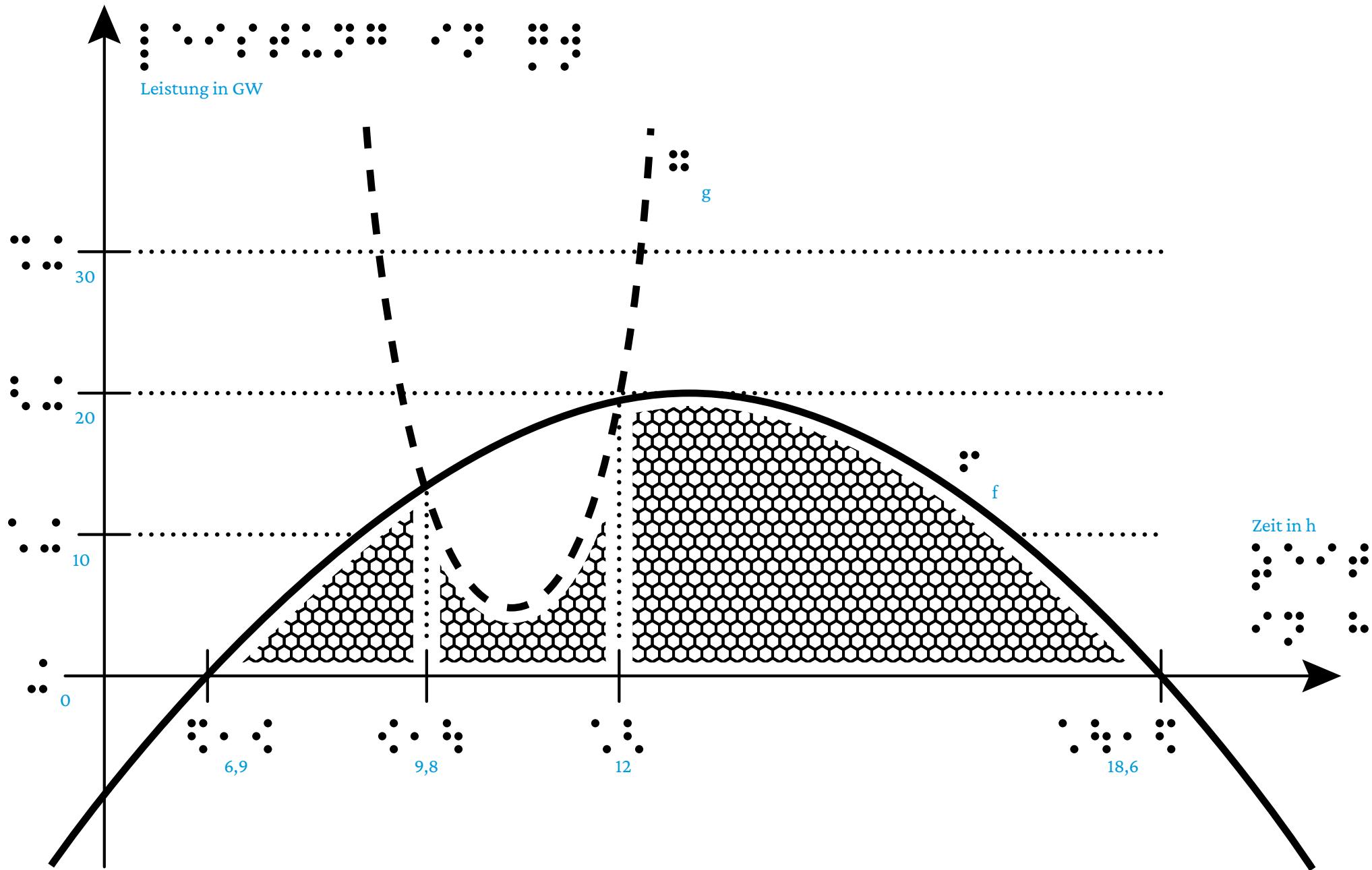
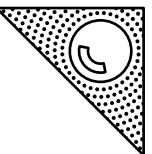


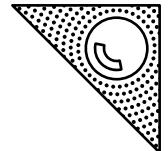


Ang. Mat. HAK4



S.124 5.93 c)





Ang. Mat. HAK4

6. Beschreibende Statistik

Angewandte Mathematik HAK Band 4

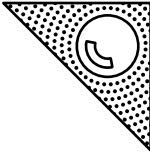
6.

Beschreibende Statistik

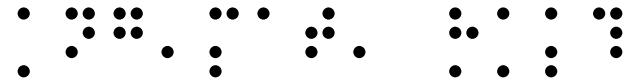
; : ; ; ; ; ; ; ; ; ;

; : ; ; ; ; ; ; ; ;

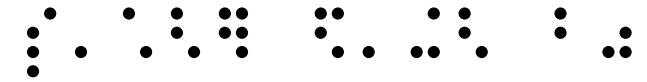
; ; ; ; ; ; ; ; ; ;



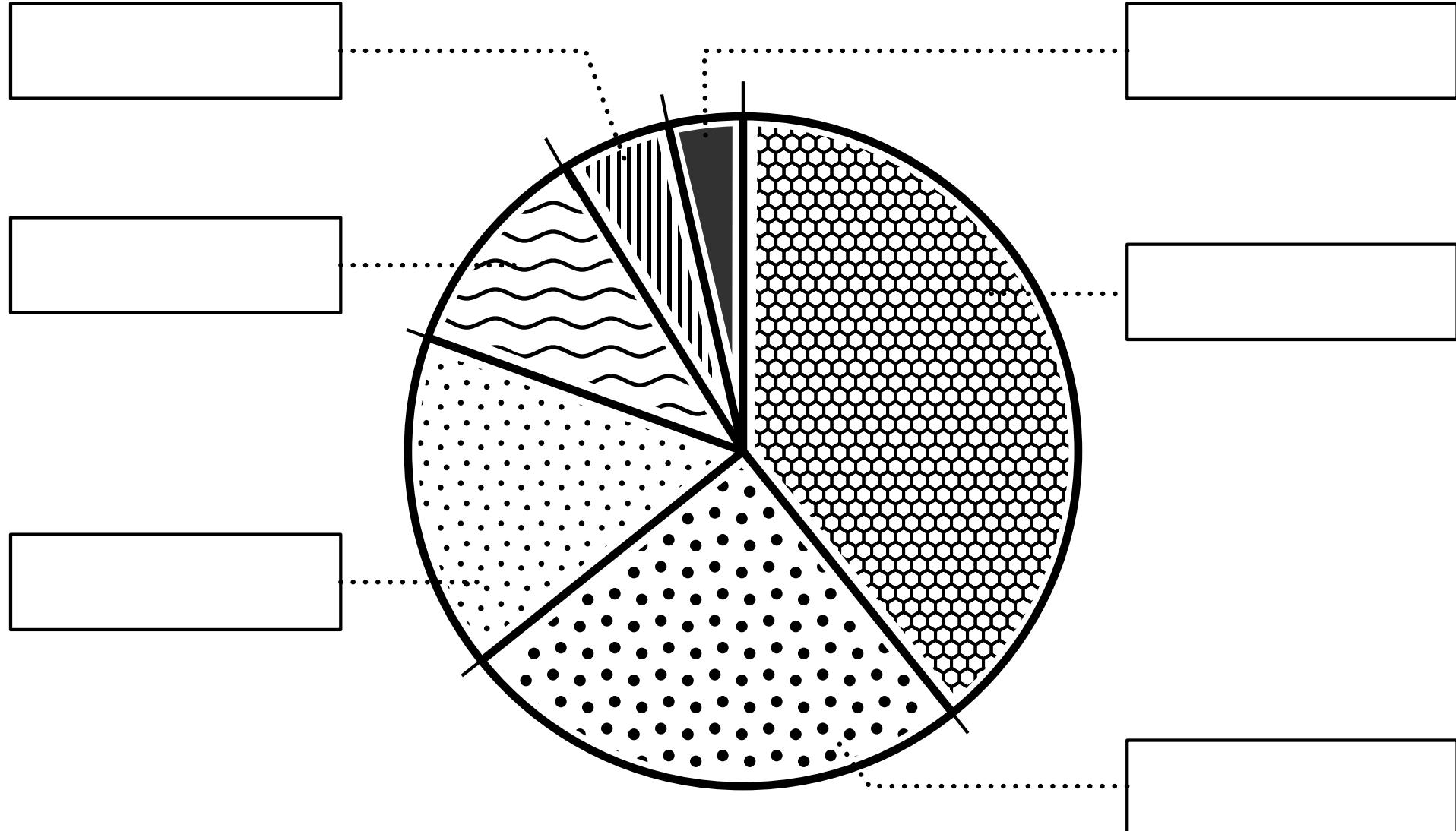
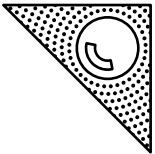
	22
	14
	3
	9
	6
	2

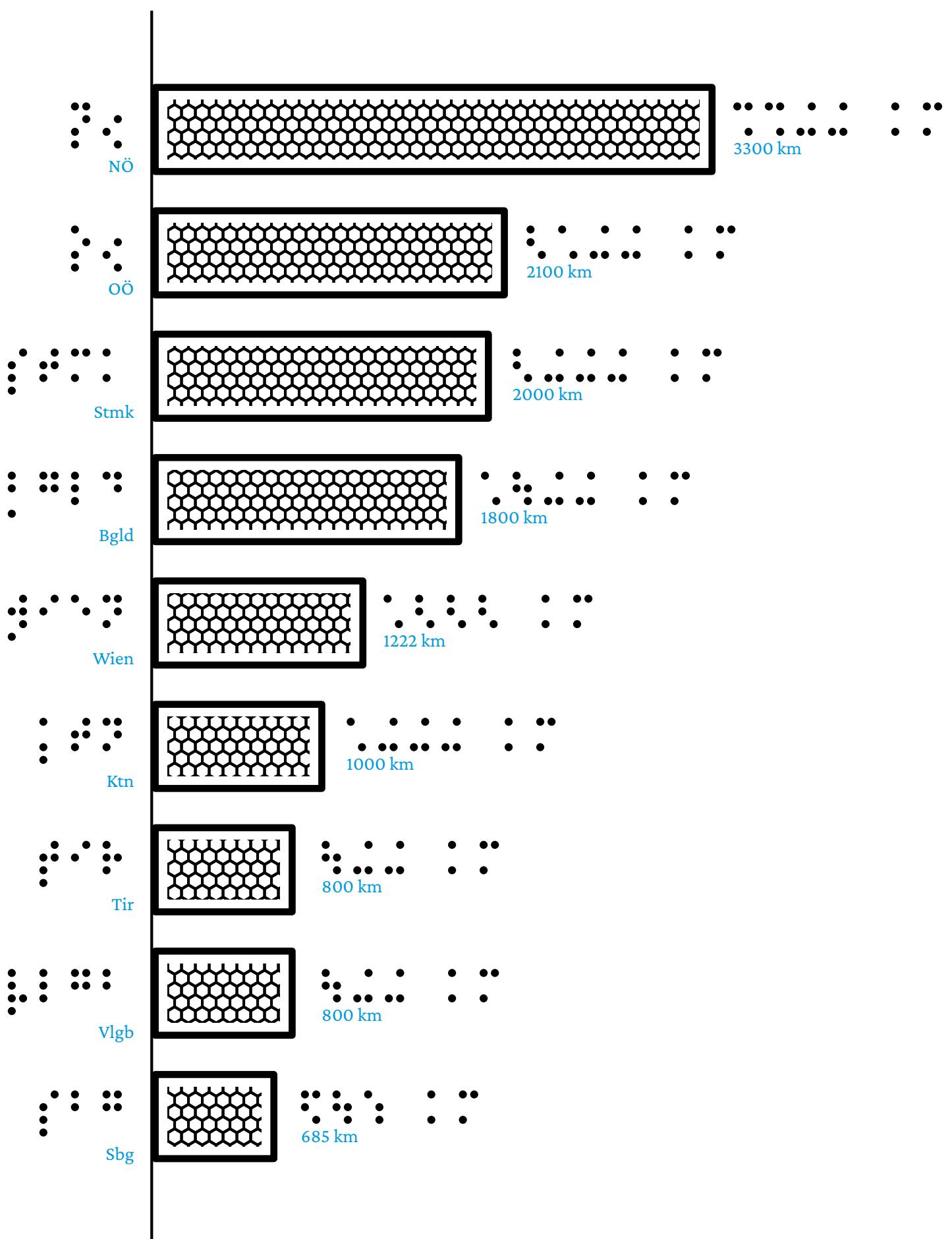
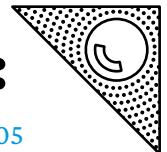
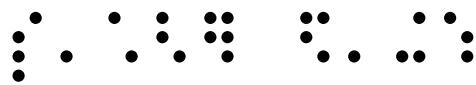
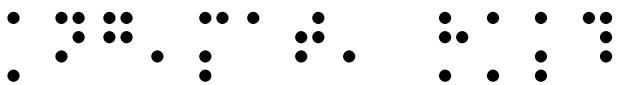


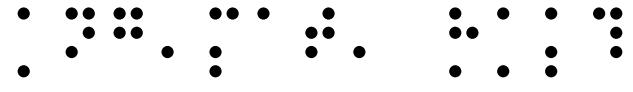
Ang. Mat. HAK4



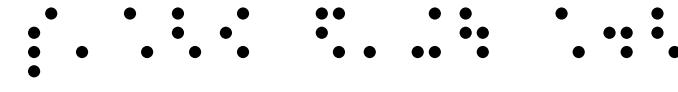
S.127 6.02 b)



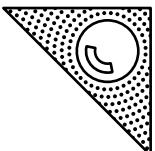




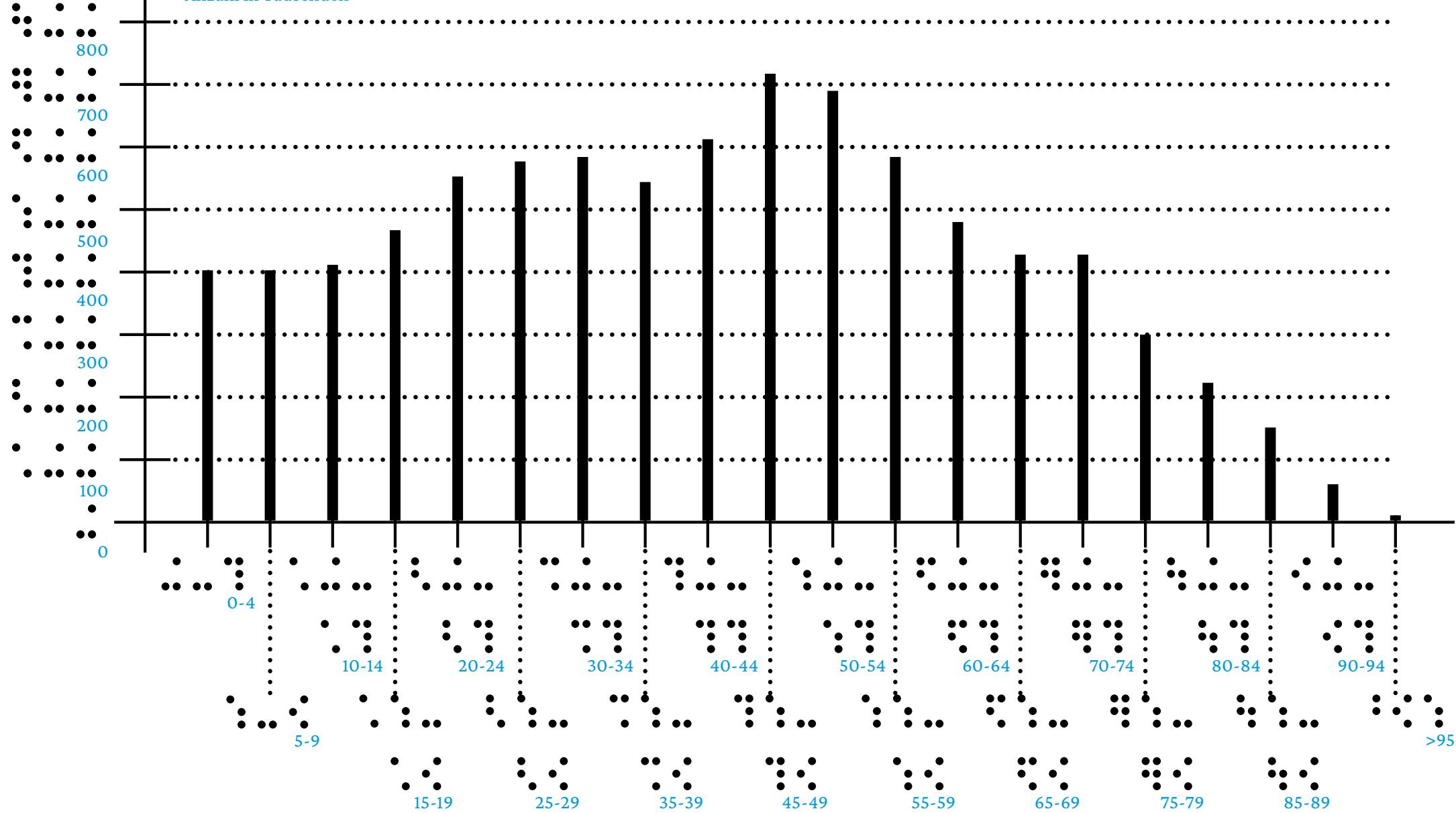
Ang.Mat. HAK4

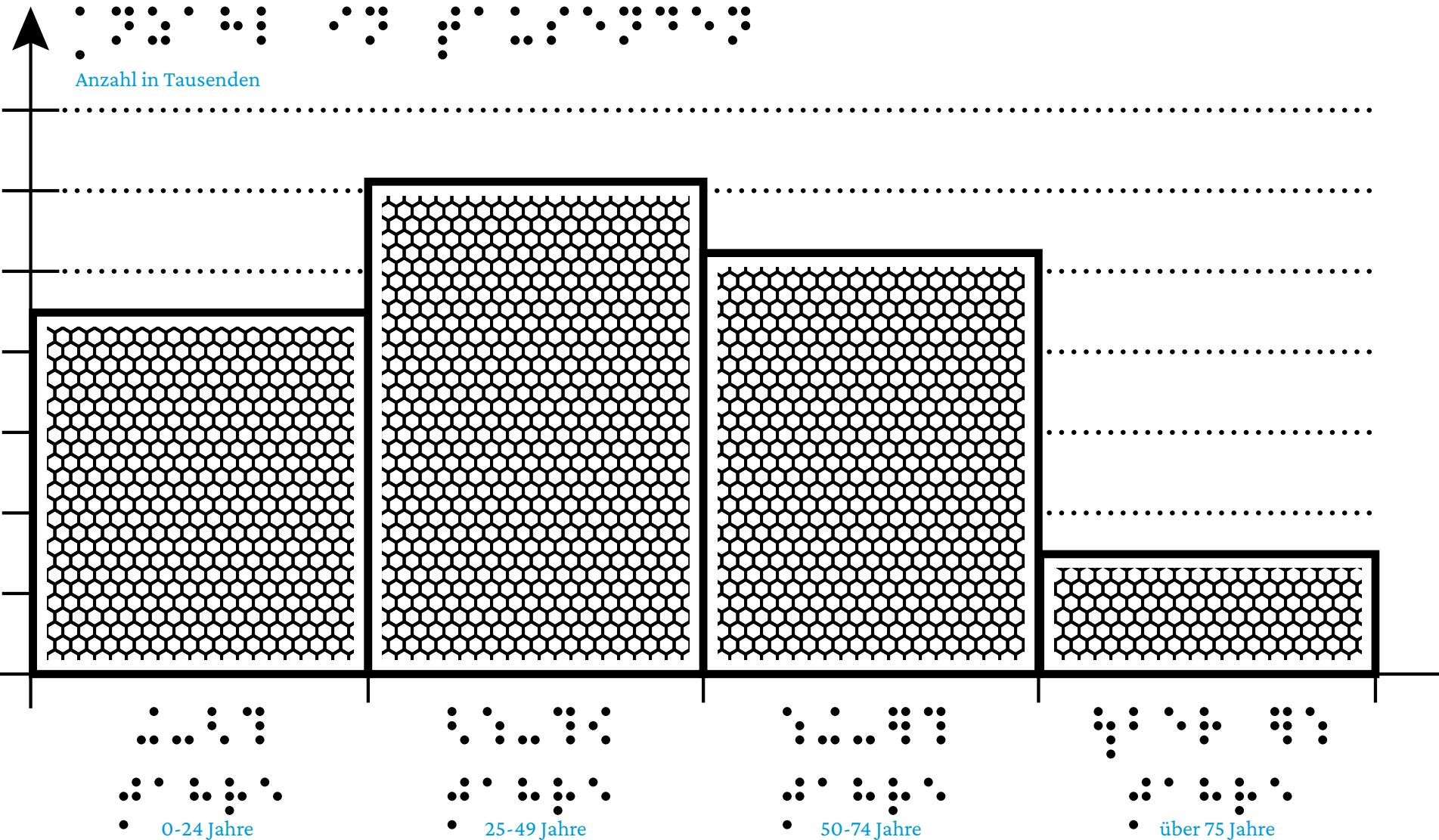
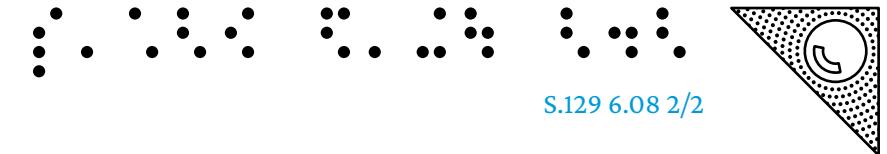
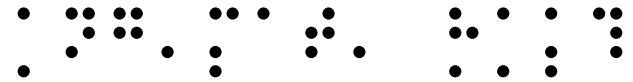


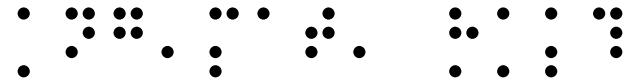
S.129 6.08 1/2



Anzahl in Tausenden



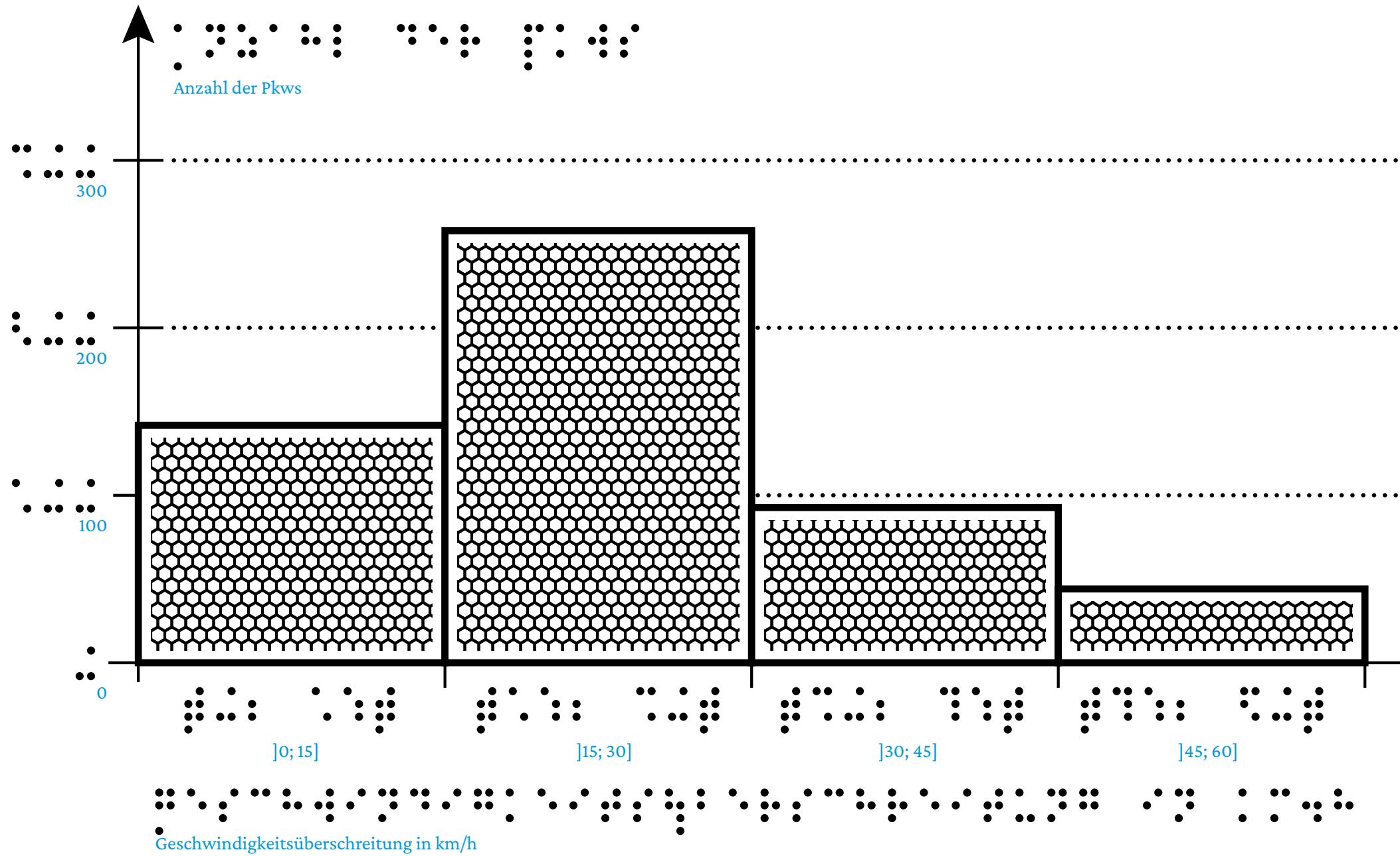
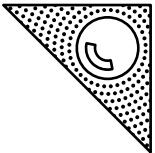


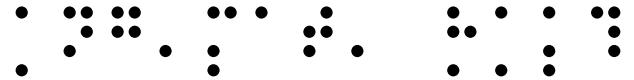


Ang. Mat. HAK4

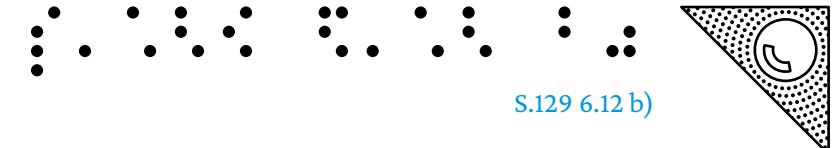


S.129 6.09

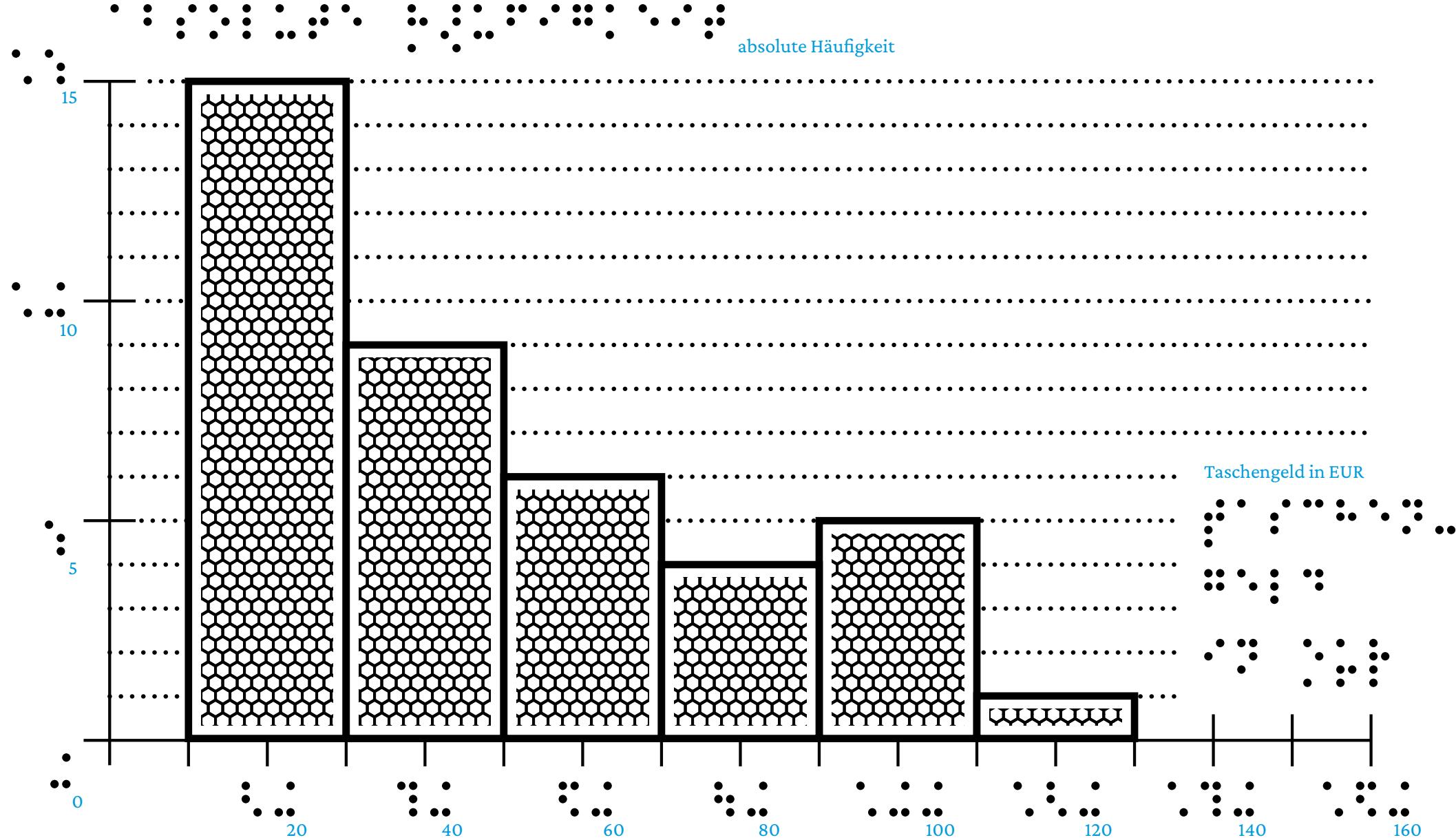
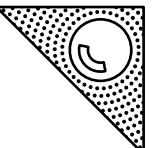


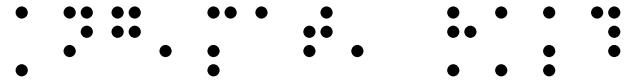


Ang. Mat. HAK4

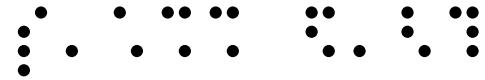


S.129 6.12 b)

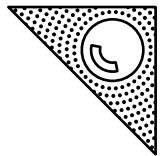




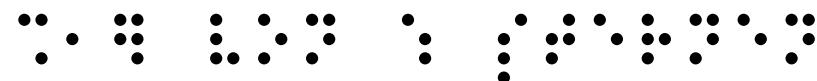
Ang. Mat. HAK4



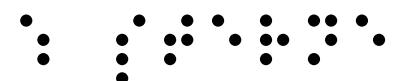
S.133 6.24



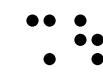
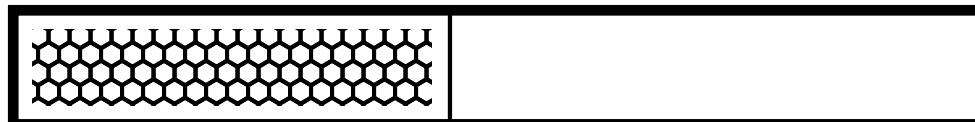
84



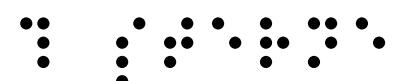
3,5 von 5 Sternen



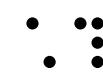
5 Sterne



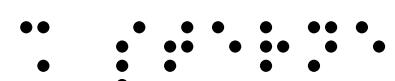
38



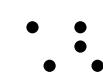
4 Sterne



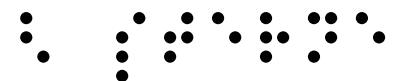
14



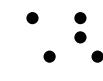
3 Sterne



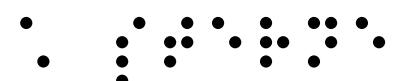
12



2 Sterne



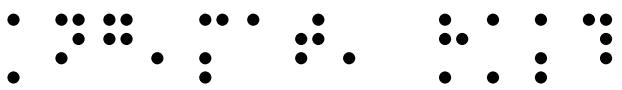
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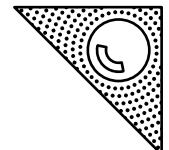
1 Sterne



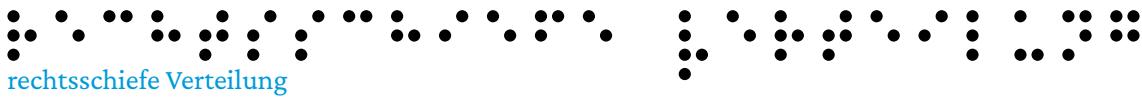
8



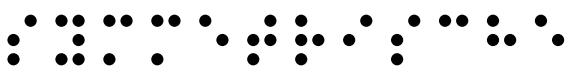
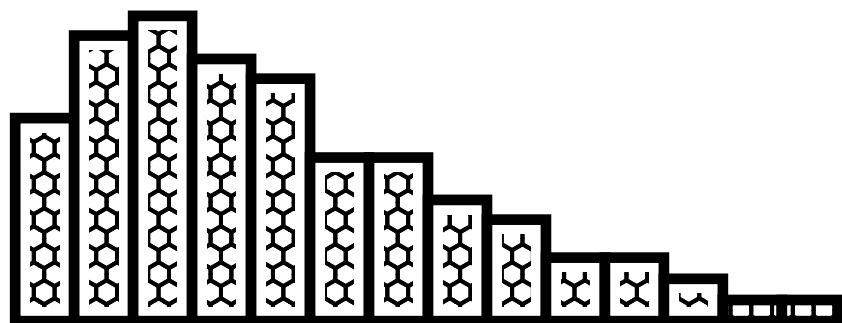
Ang. Mat. HAK4



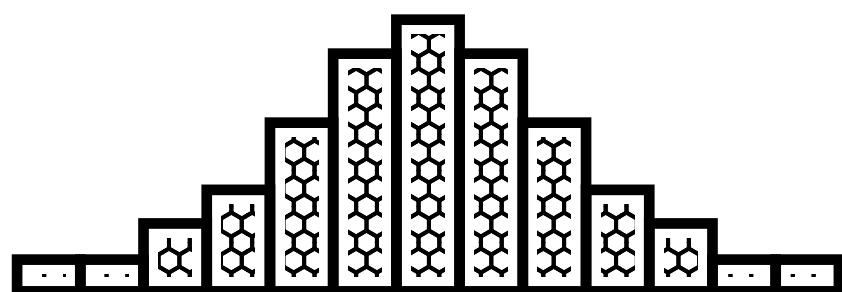
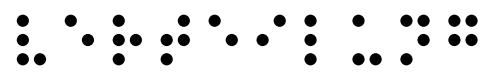
S.134



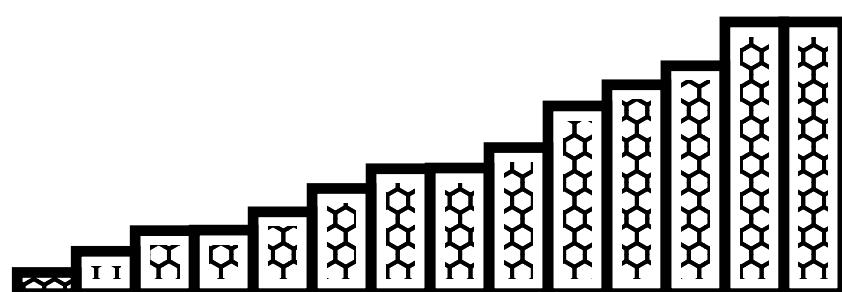
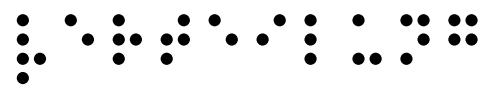
rechtsschiefe Verteilung

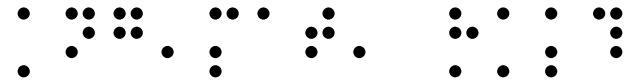


symmetrische Verteilung



linksschiefe Verteilung

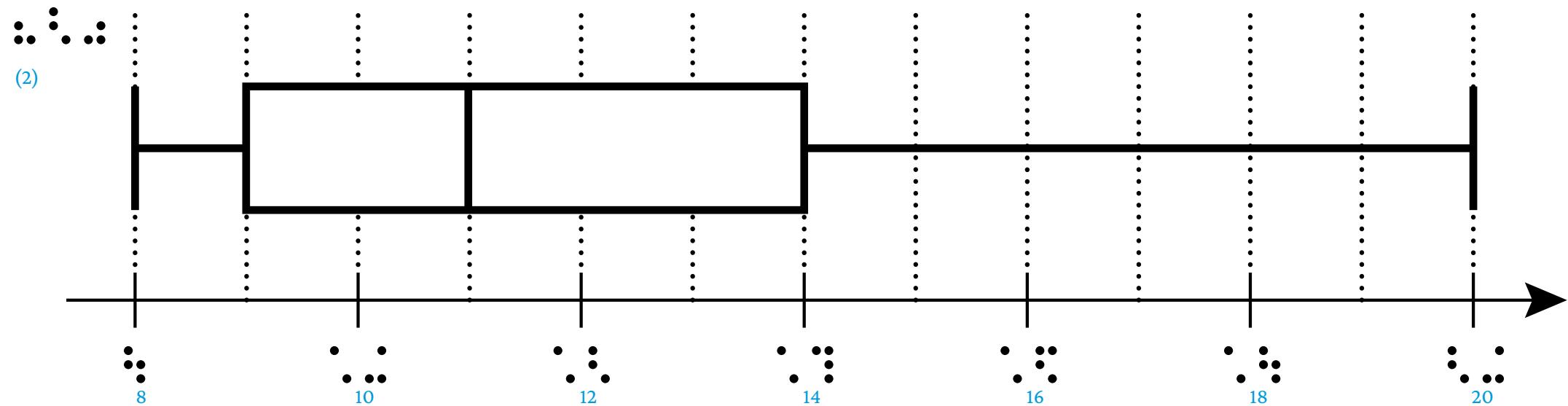
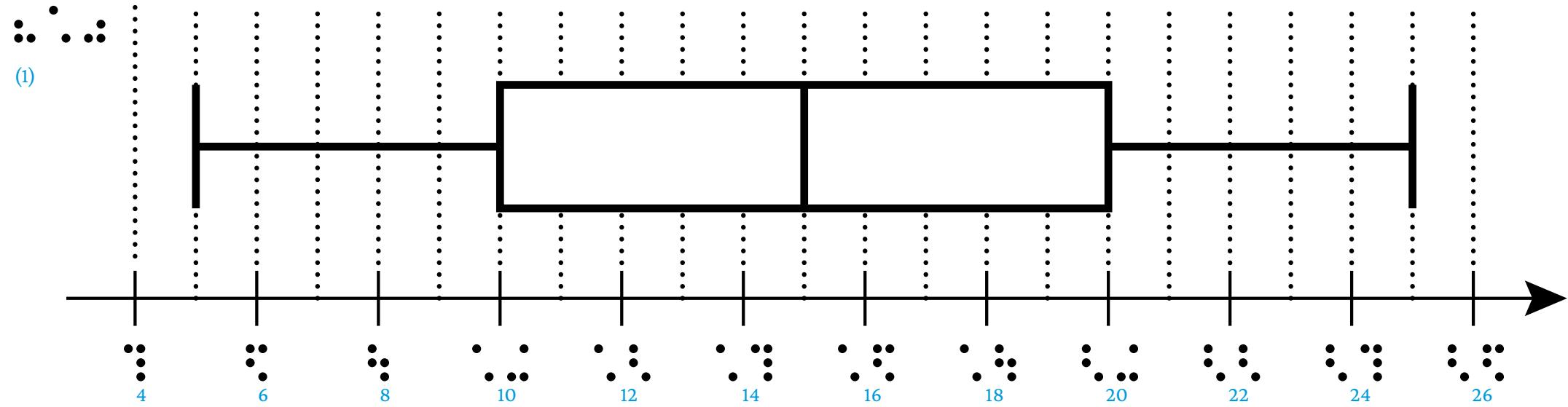
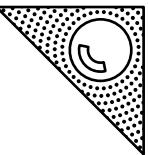


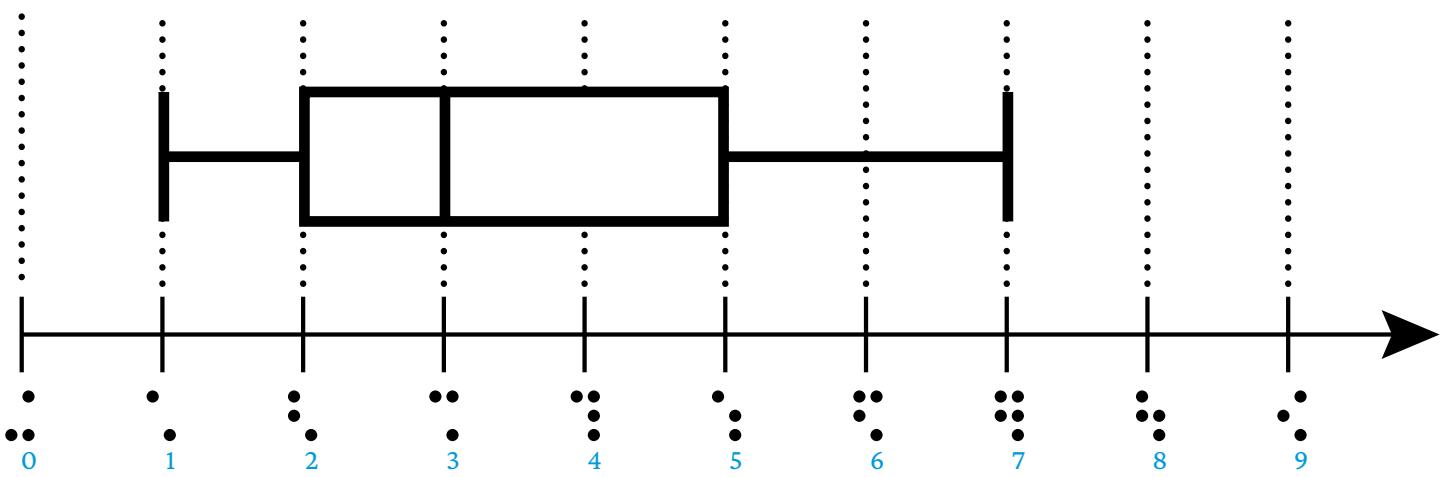
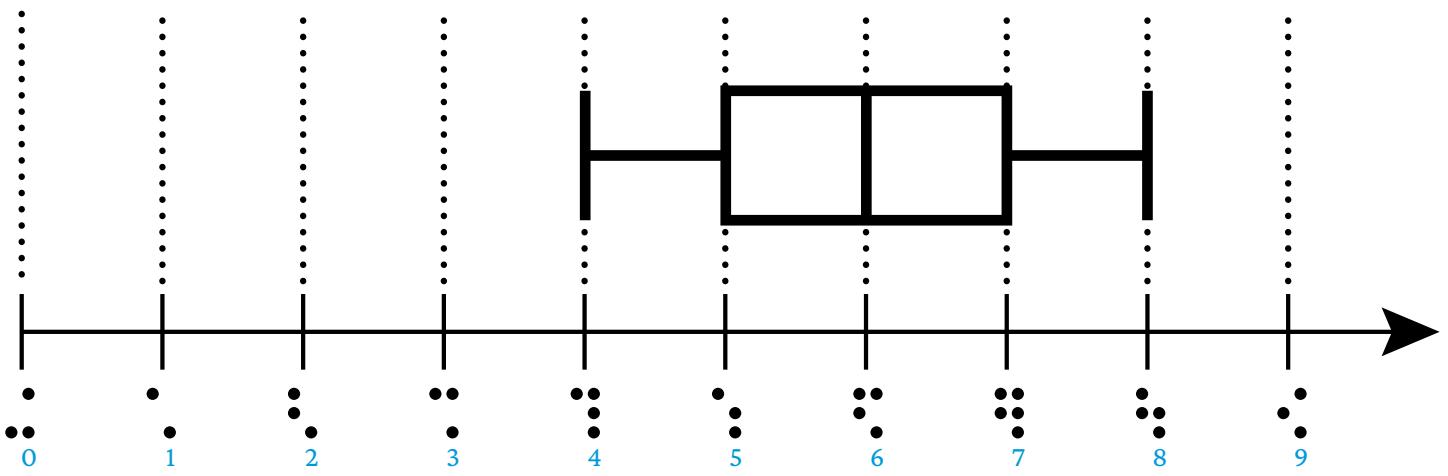
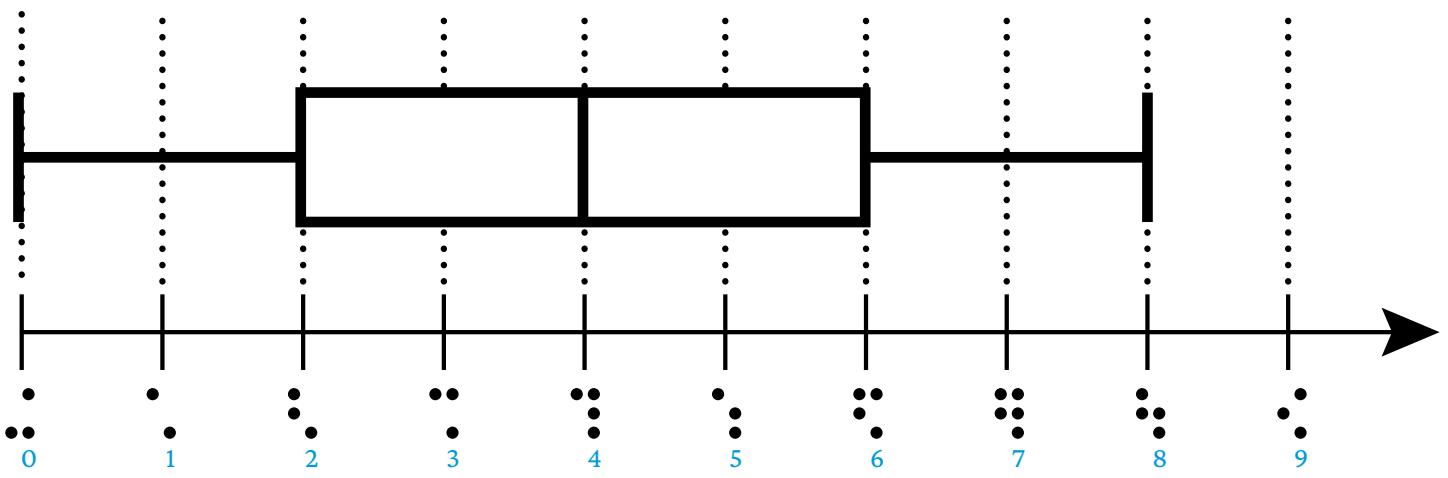
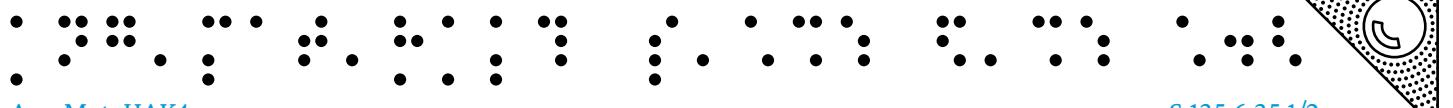


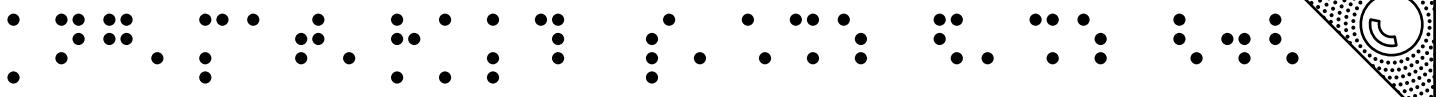
Ang.Mat. HAK4



S.135 6.32

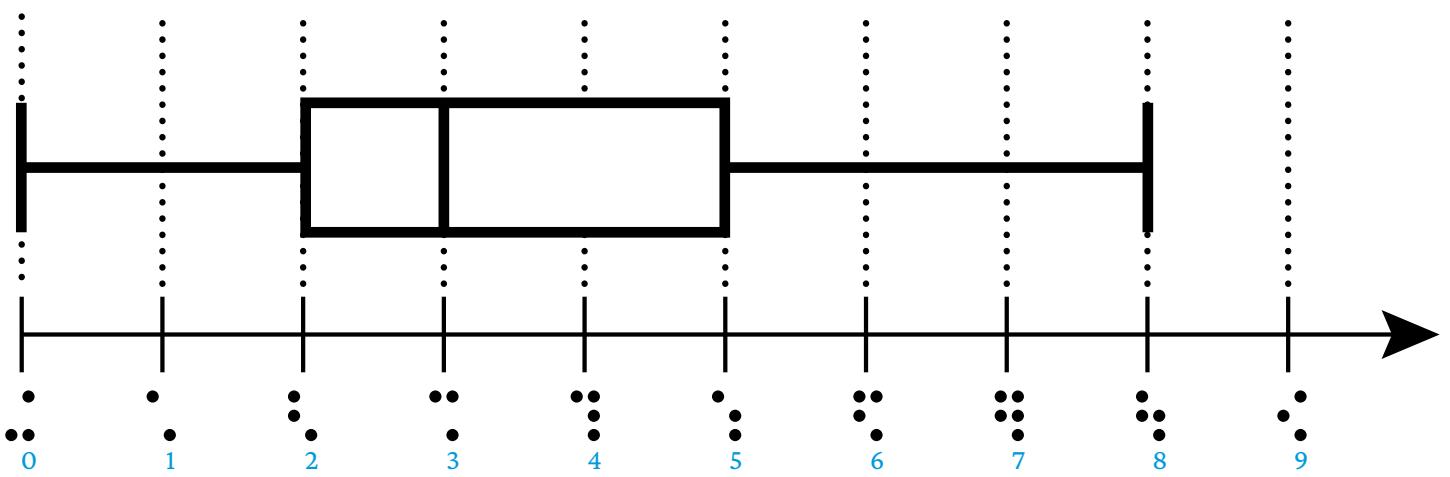
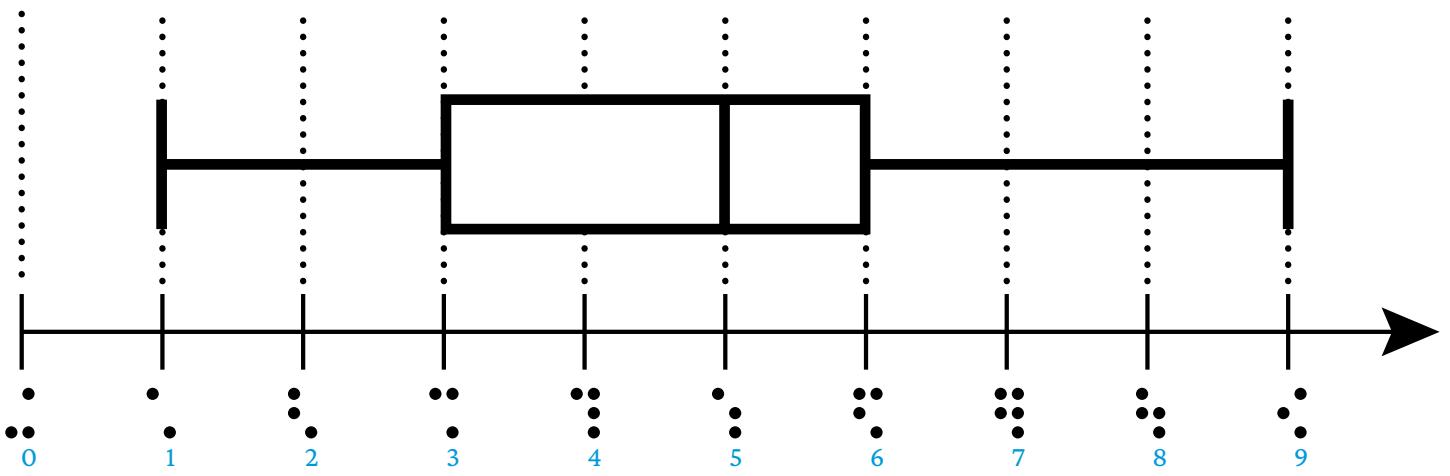
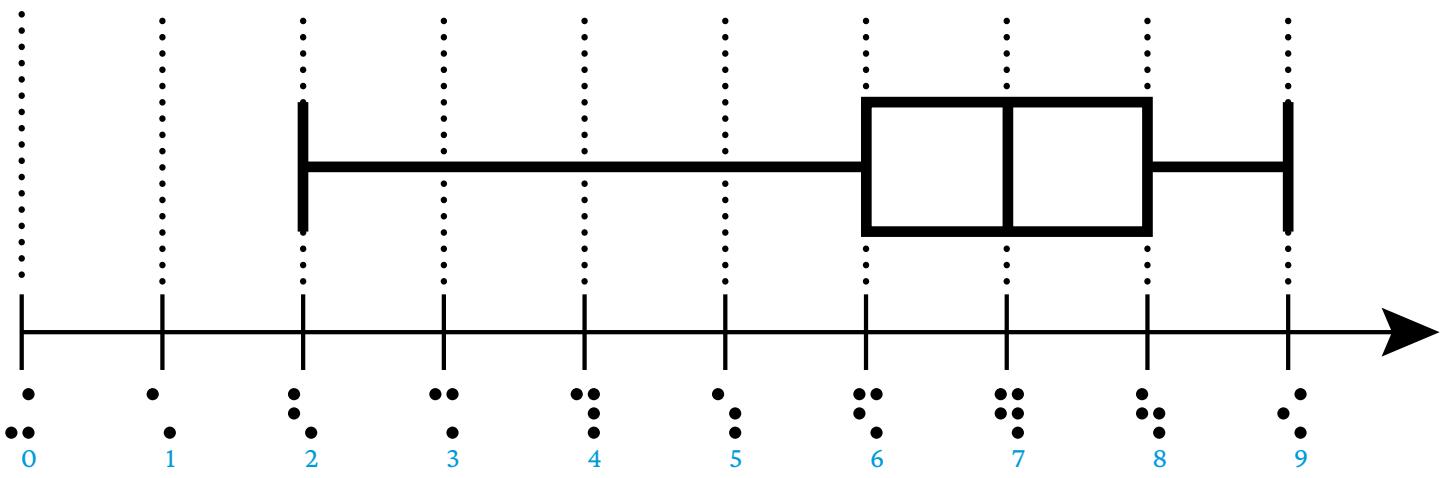


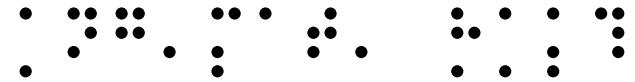




Ang. Mat. HAK4

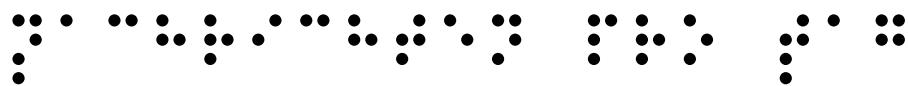
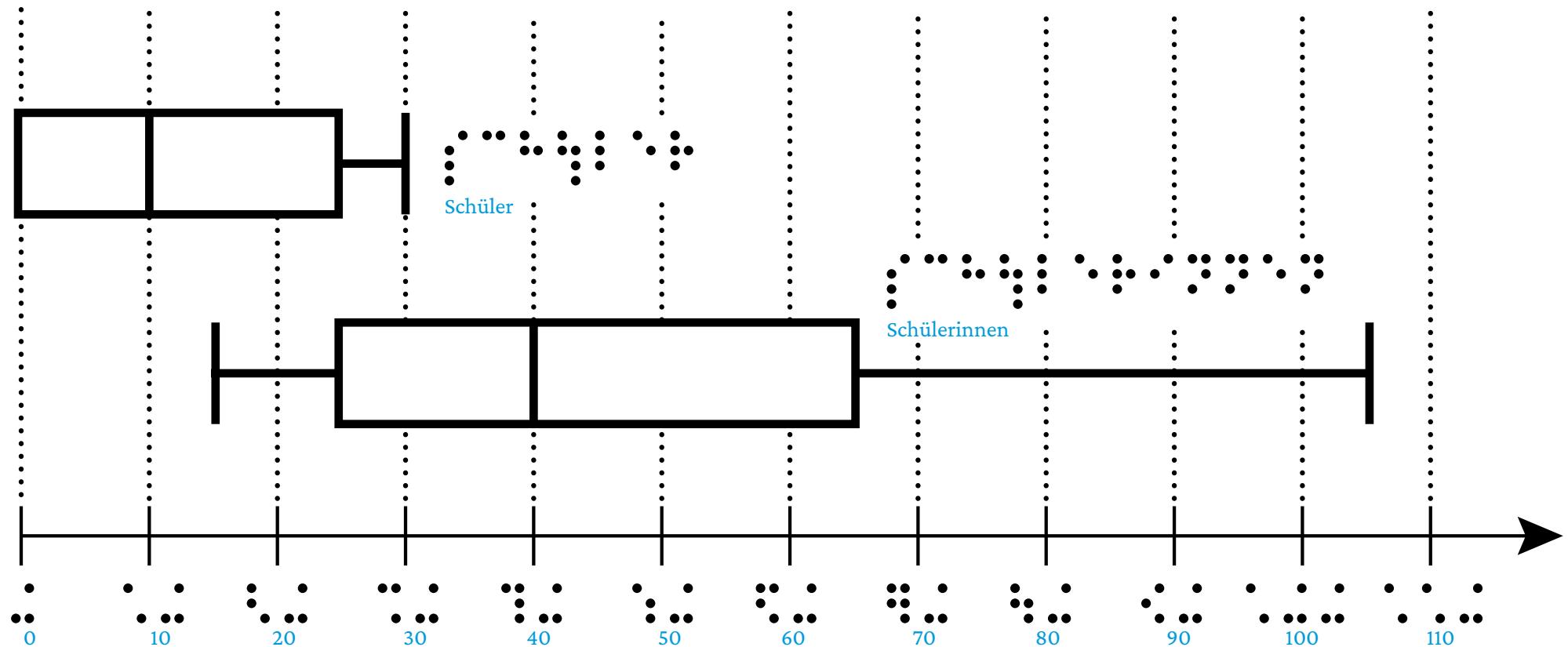
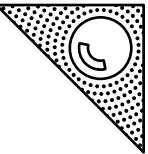
S.135 6.35 2/2





Ang. Mat. HAK4

S.135 6.36



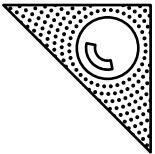
Nachrichten pro Tag

The image shows a single row of Braille characters. Each character is composed of a 2x5 grid of dots. The characters represent the letters 'W', 'A', 'T', 'E', 'R'. The 'W' has a vertical bar on the left and a horizontal bar across the top. The 'A' has a vertical bar on the left and a central dot. The 'T' has a vertical bar on the left and a central dot. The 'E' has a vertical bar on the left and a central dot. The 'R' has a vertical bar on the left and a central dot.

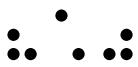
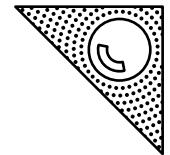
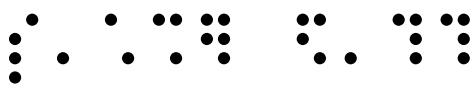
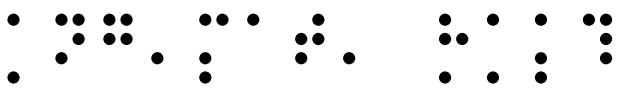
Ang.Mat. HAK4

The image shows a sequence of Braille characters arranged horizontally. The first character is a single dot at the top left. This is followed by a series of characters representing the numbers 1 through 10. Each number is formed by a specific pattern of dots in the Braille cell. The sequence continues until the tenth character, which is a single dot at the top right.

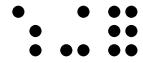
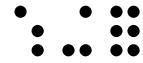
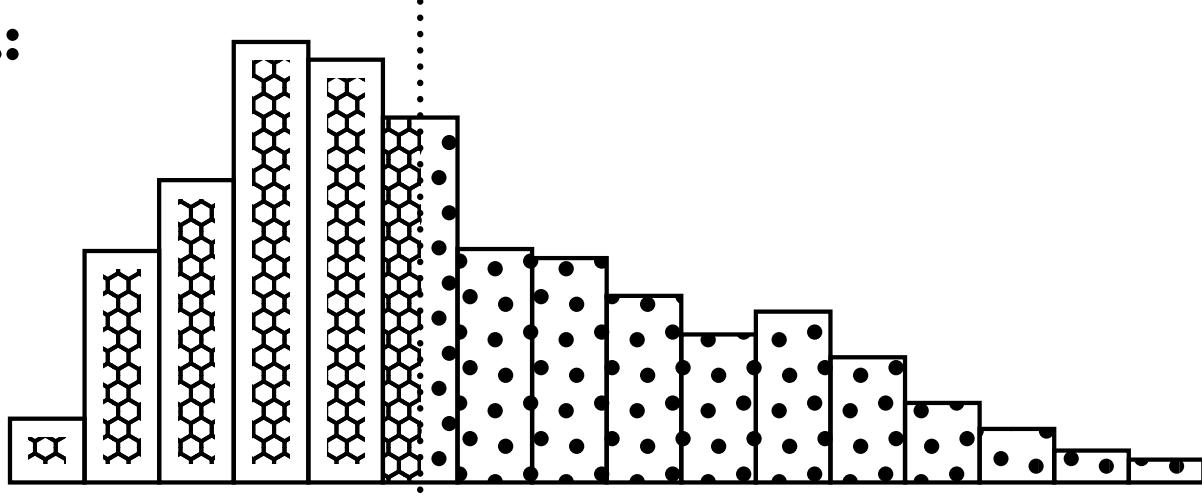
S.137 6.40



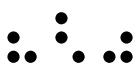
A diagram illustrating a hexagonal lattice strip. The strip is bounded by a thick black rectangular frame. Inside, a single layer of hexagons is arranged horizontally. On the left boundary, there are two black dots above the first hexagon and one black dot below the last hexagon. On the right boundary, there are three black dots above the first hexagon and two black dots below the last hexagon. The number '2' is written in blue at the bottom left corner of the frame. Above the strip, the number '18' is written in blue. To the right of the strip, there is a sequence of black dots followed by a blue '...=' symbol.



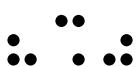
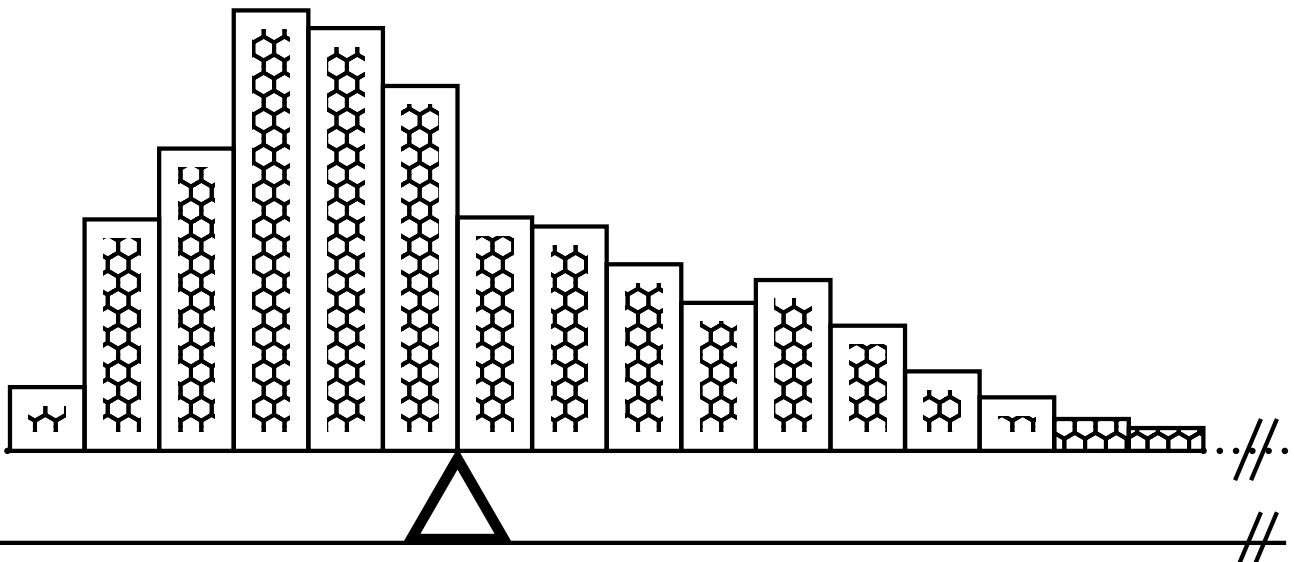
(1)



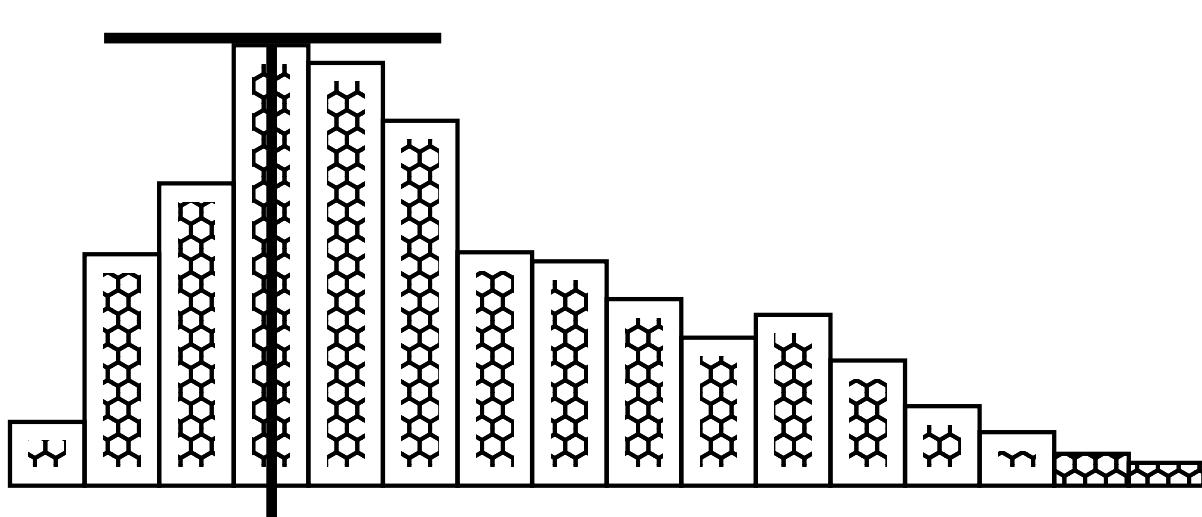
50%

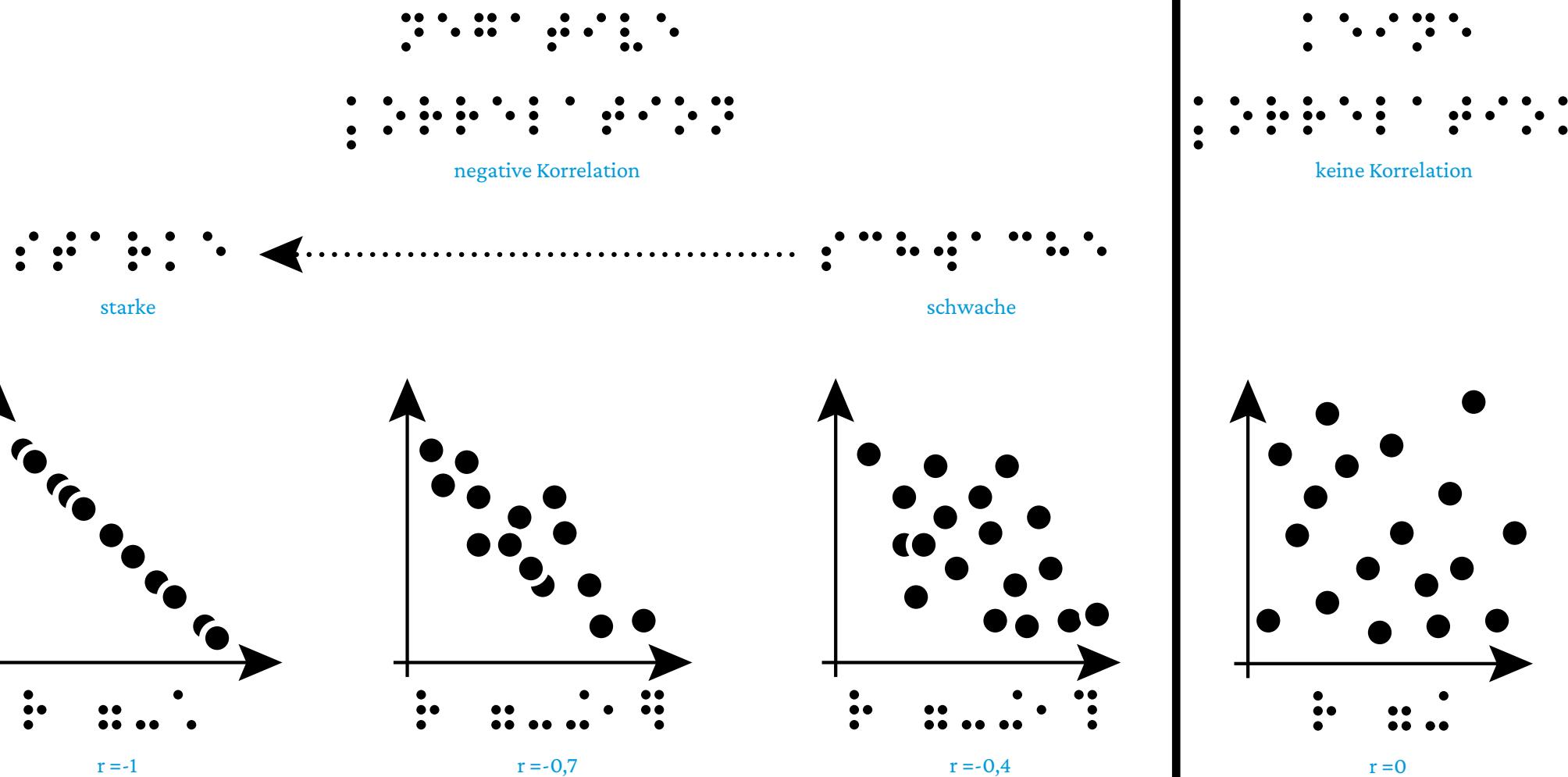
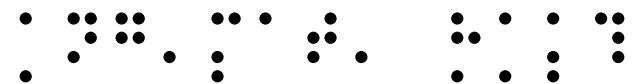


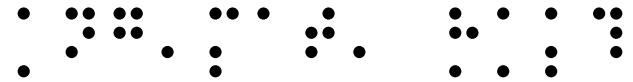
(2)



(3)







Ang. Mat. HAK4



S.141 2/2

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keine Korrelation

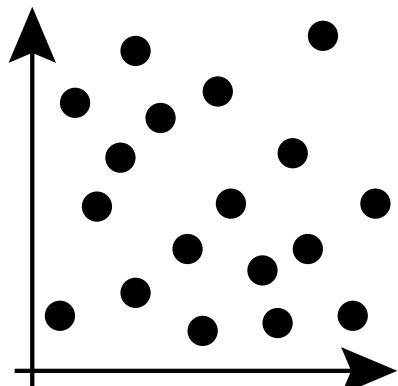
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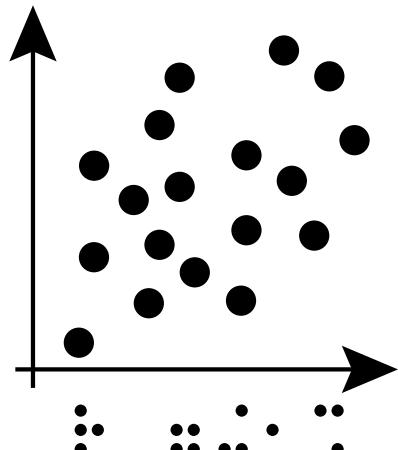
positive Korrelation

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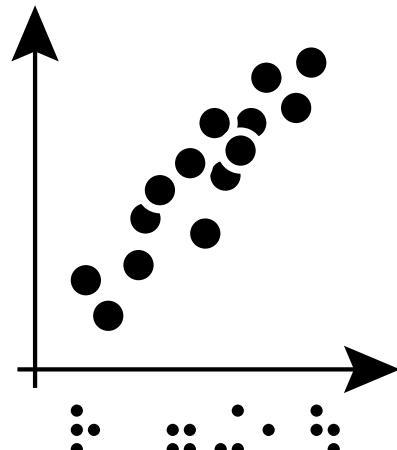
schwache



$r = 0$



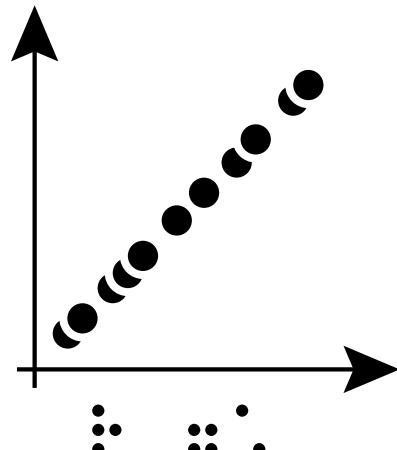
$r = 0,3$



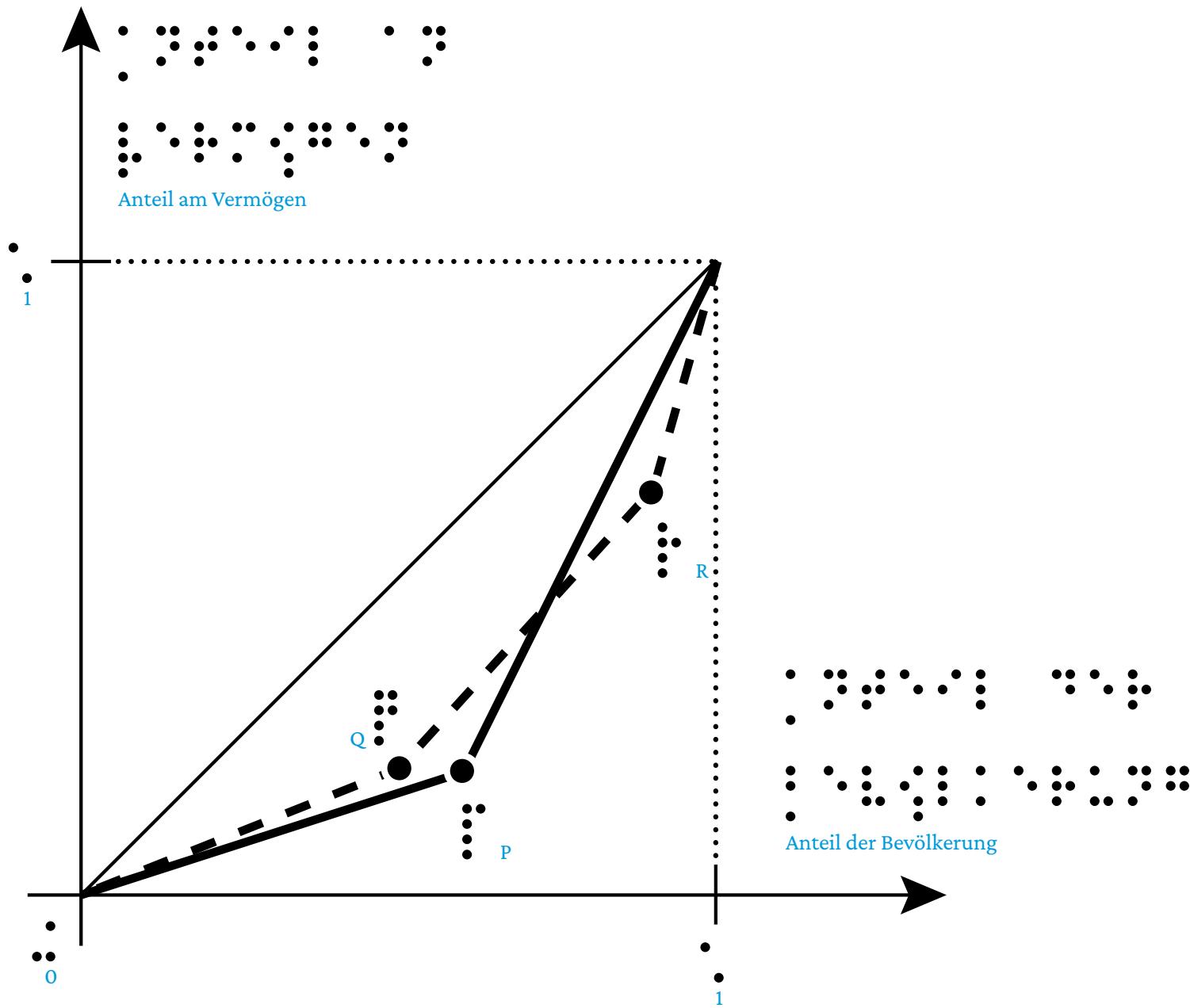
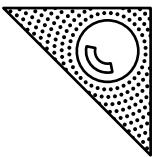
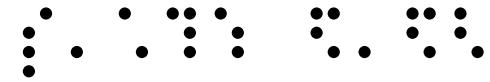
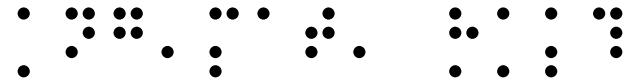
$r = 0,8$

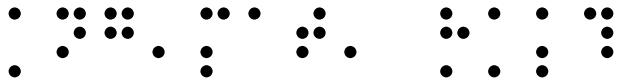
• • • • •

starke

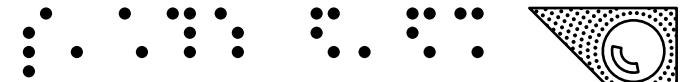


$r = 1$

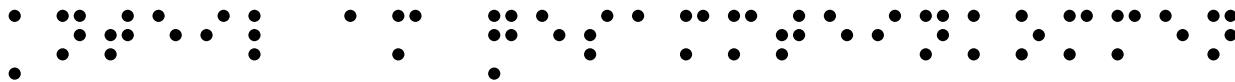




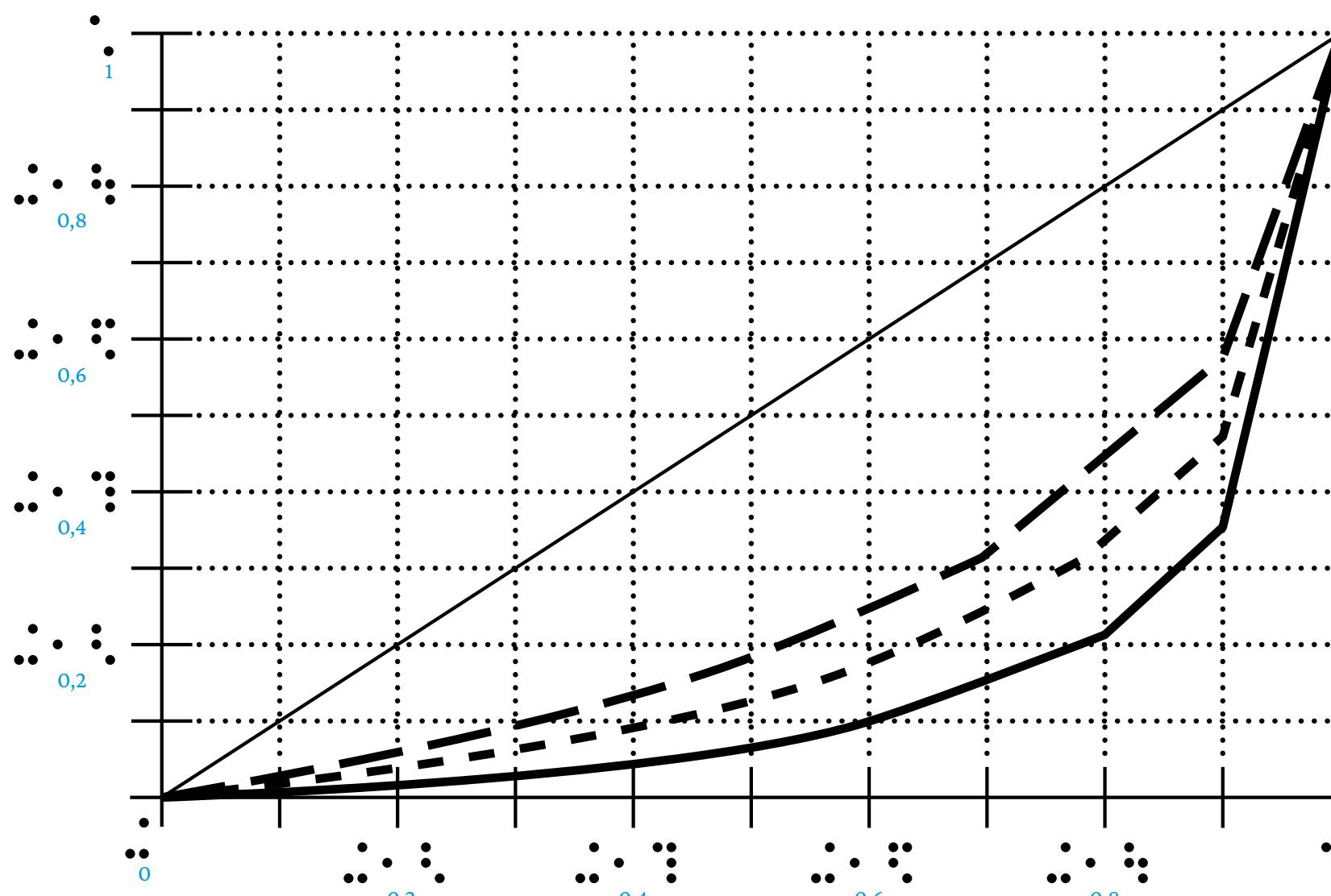
Ang. Mat. HAK4



S.145 6.63



Anteil am Gesamteinkommen



Anteil der Haushalte

Legende:



GV (Gleichverteilung)



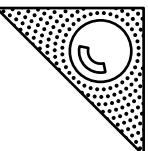
1993-94



2003-04

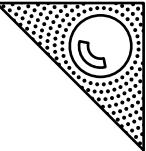


2009-10

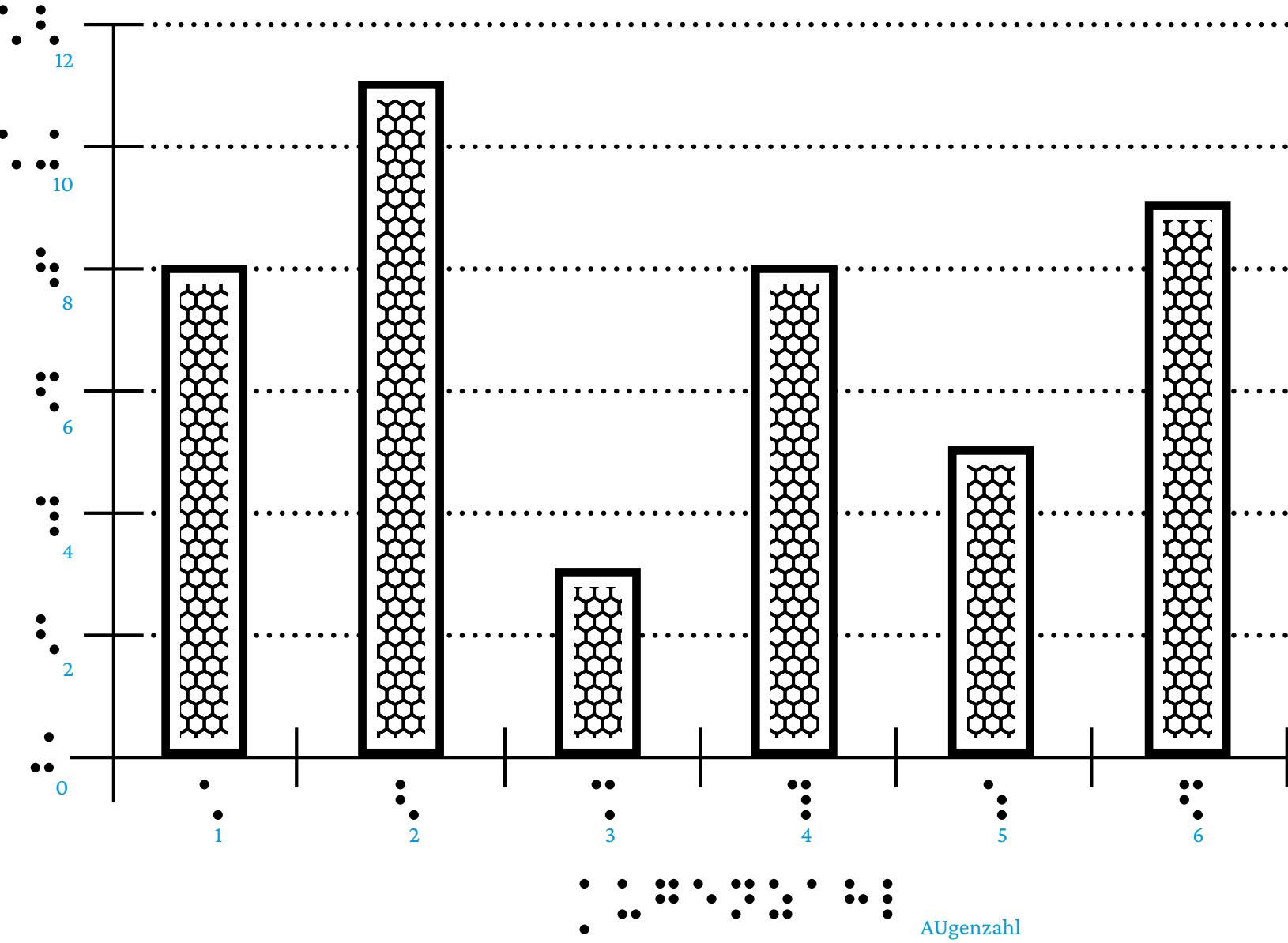


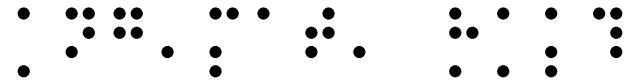
Ang. Mat. HAK4

S.146 6.65



Absolute Häufigkeit

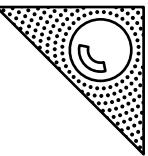




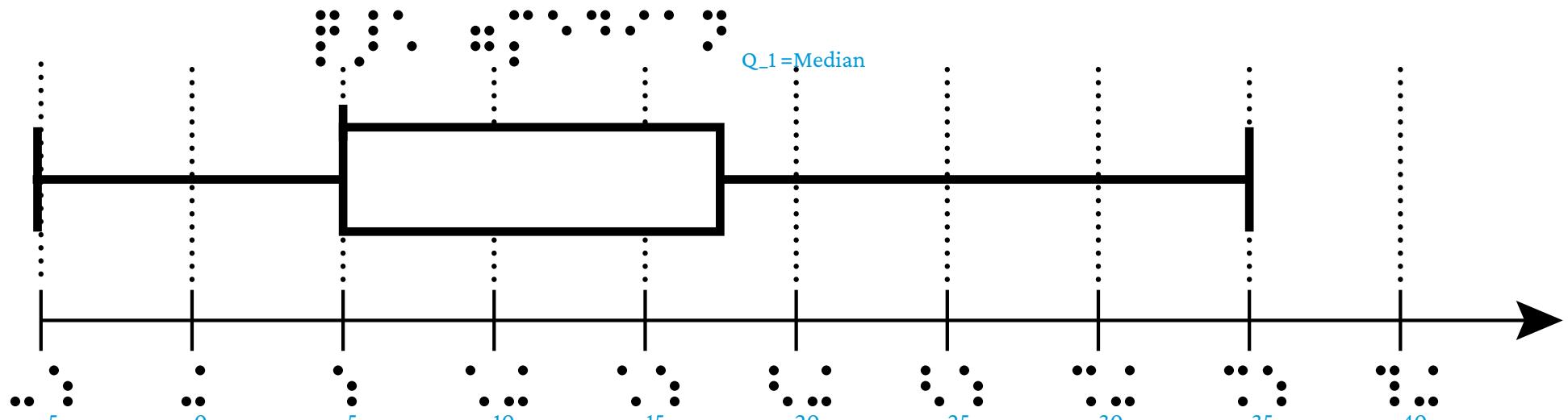
Ang. Mat. HAK4

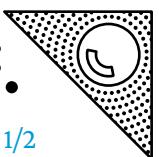


S.147 6.72

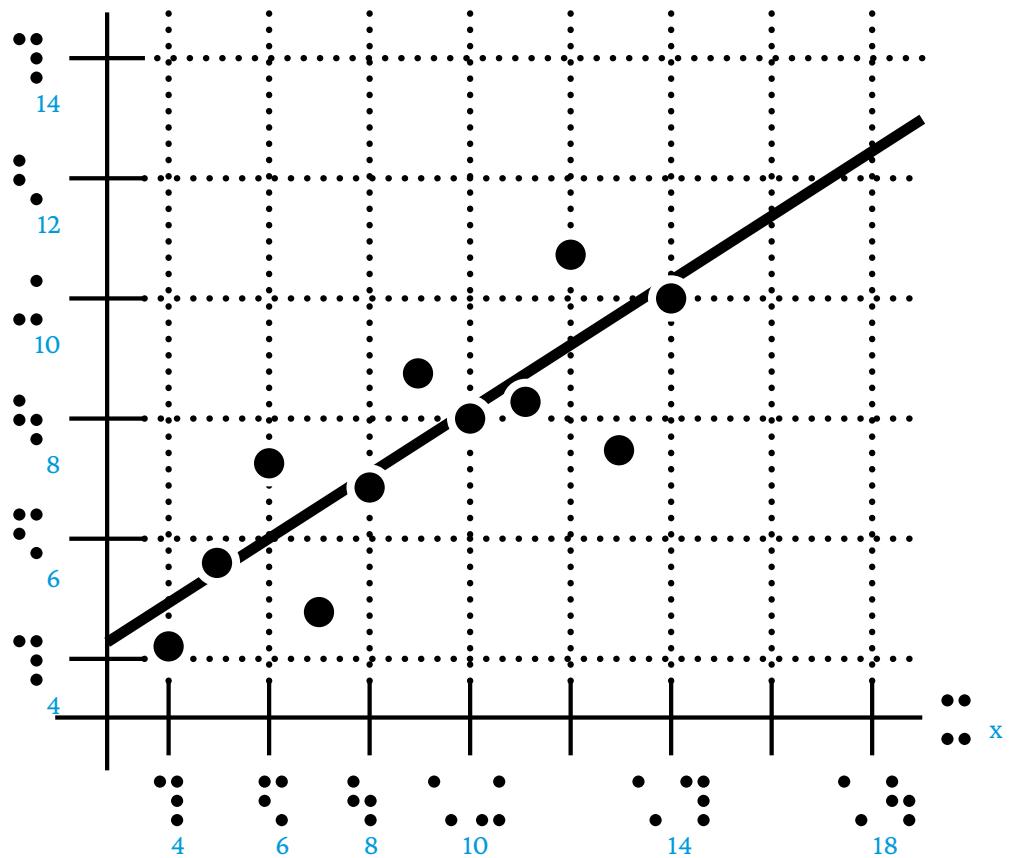


Versp. in min								
Anzahl d. Züge								

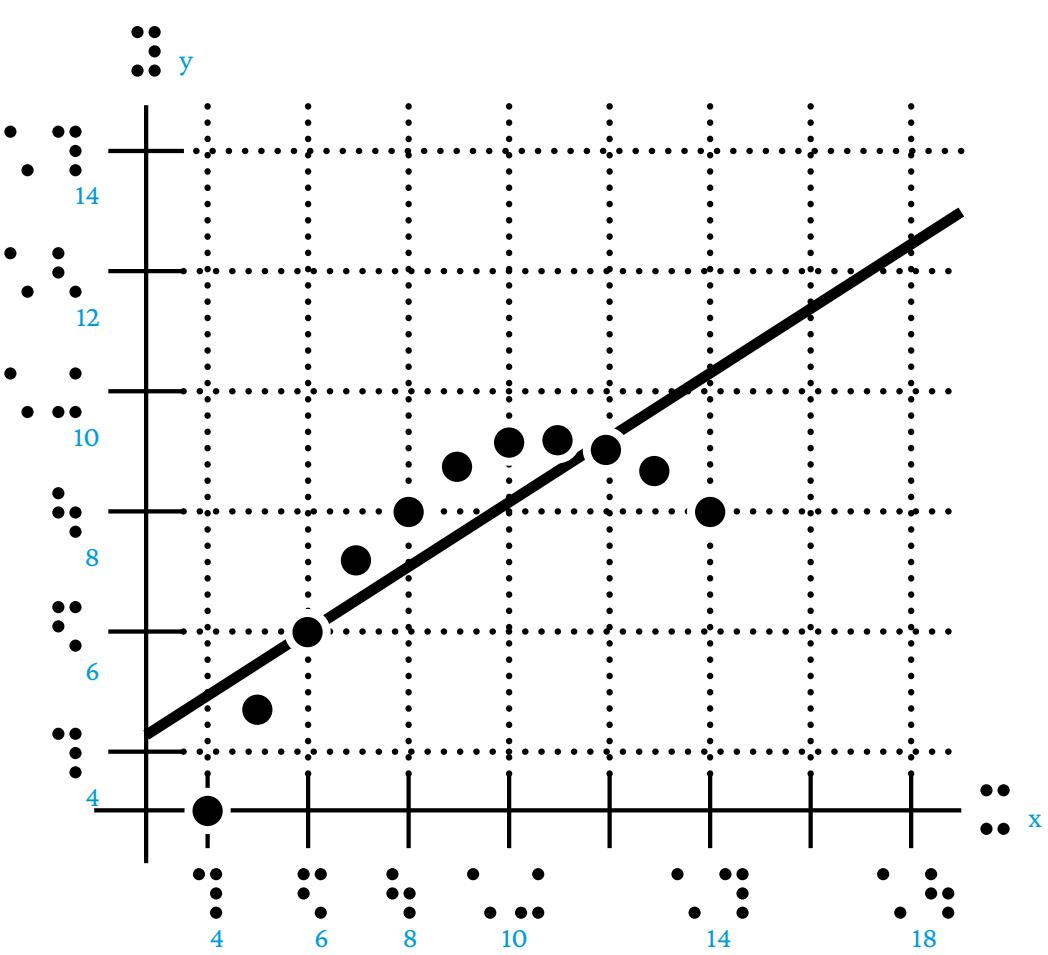


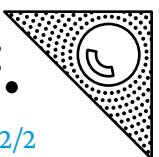
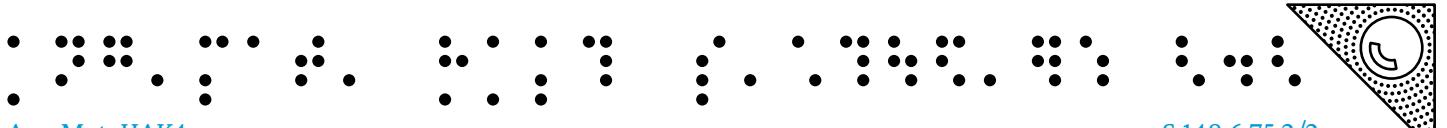


(1)

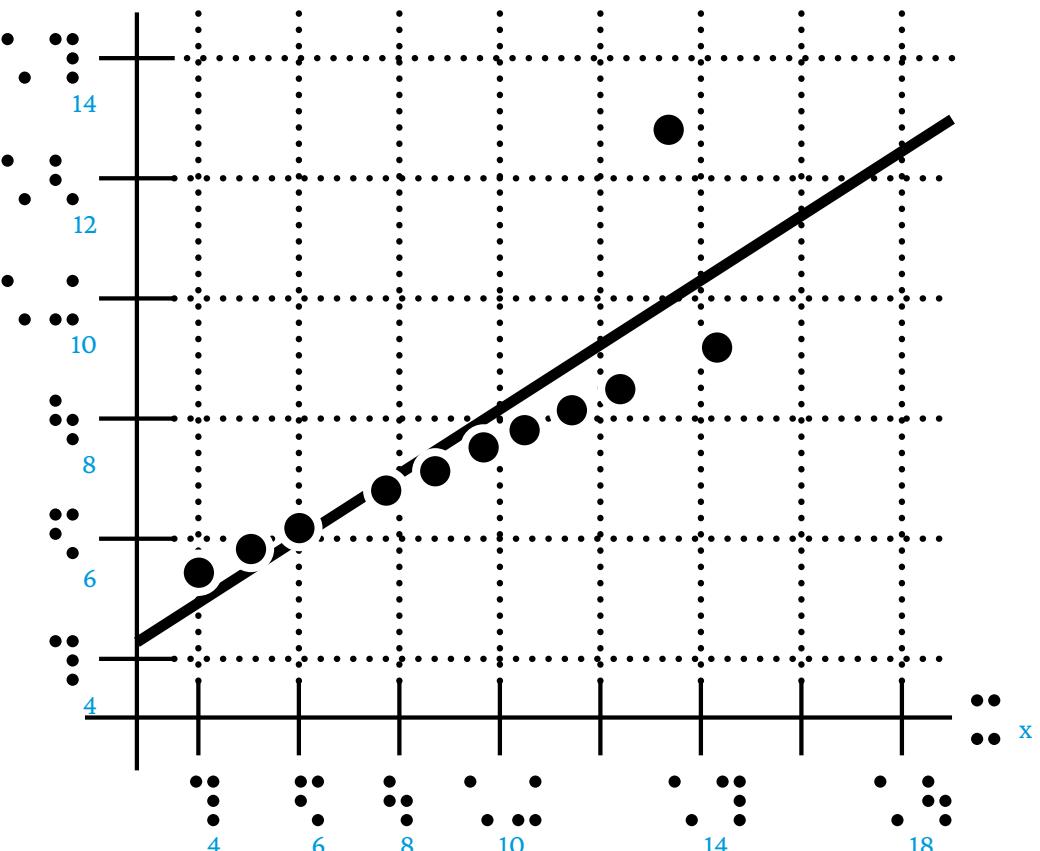


(2)



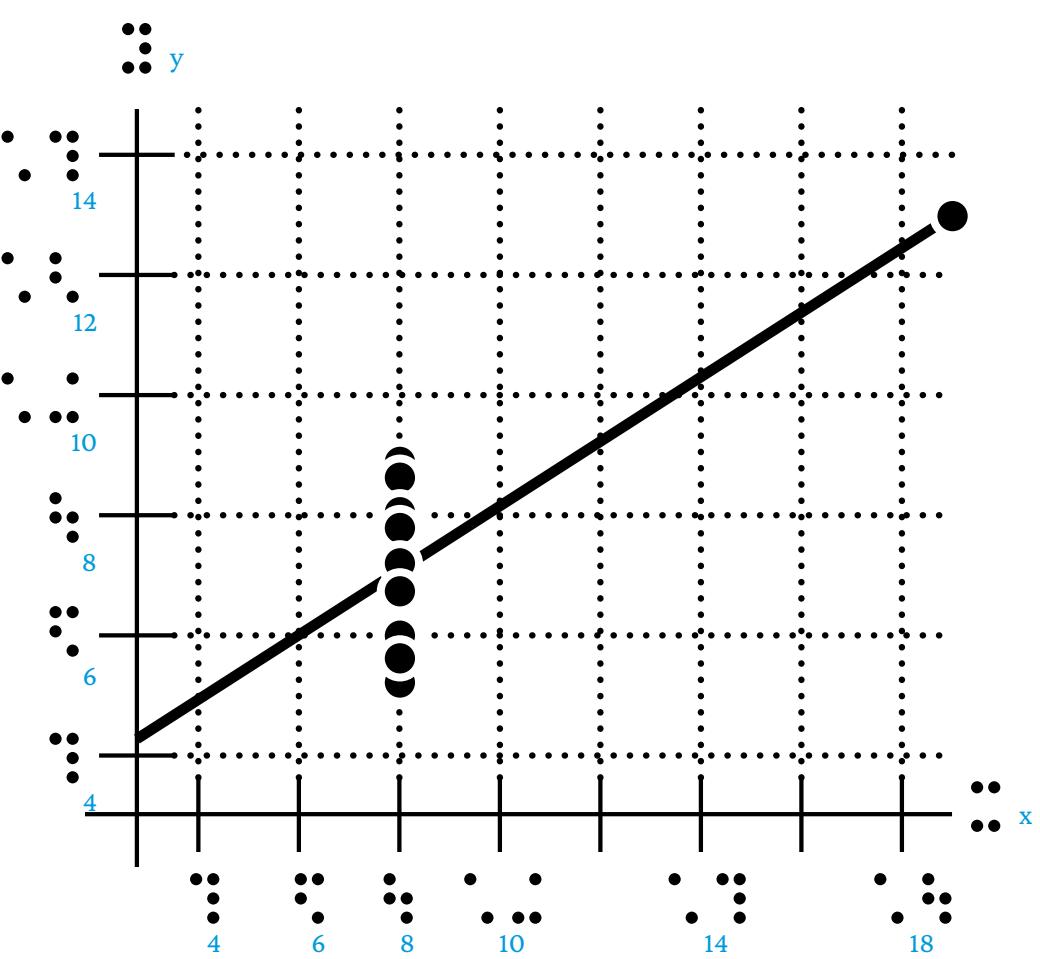


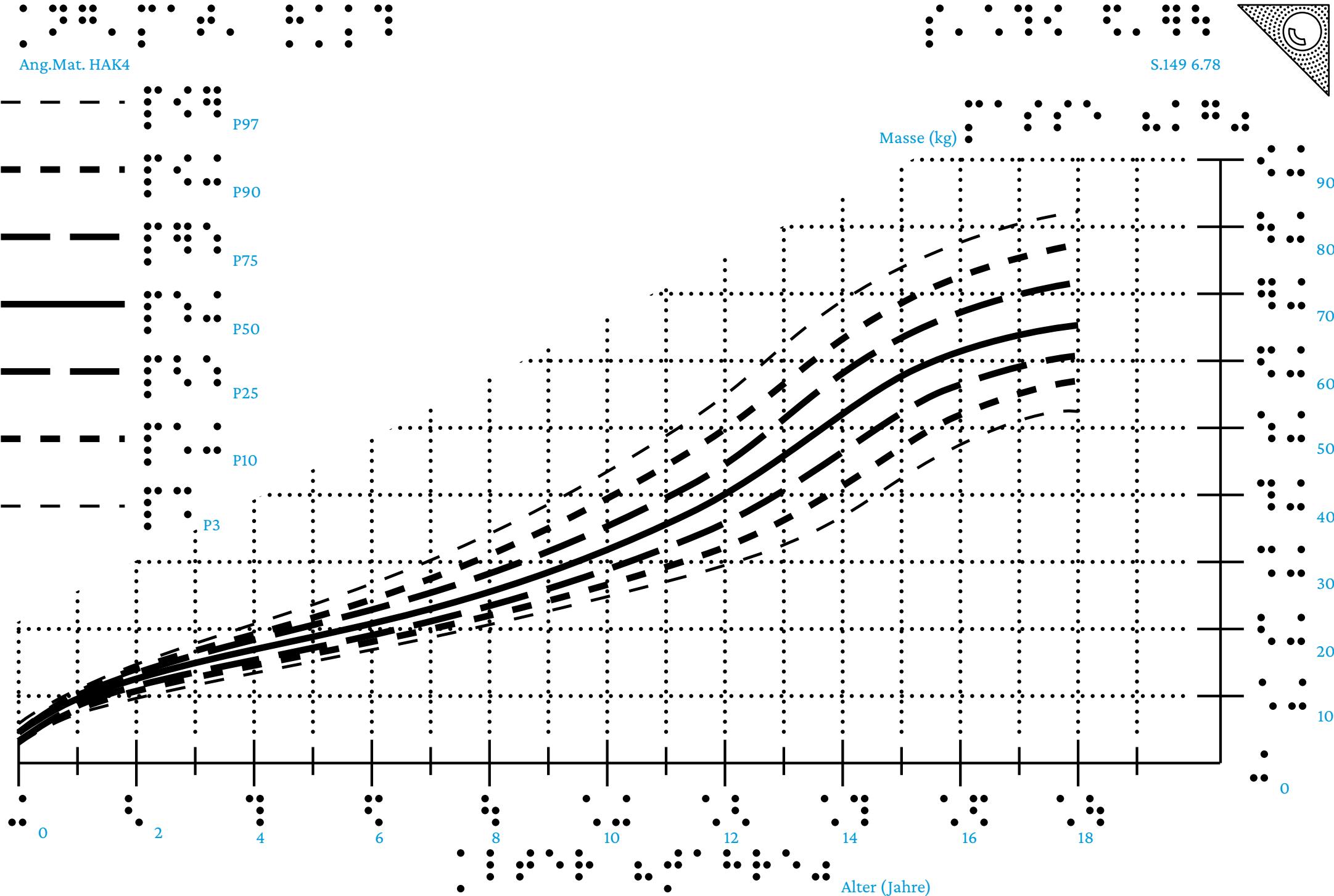
(3)

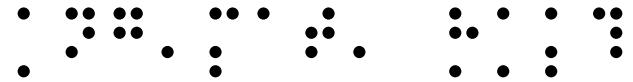


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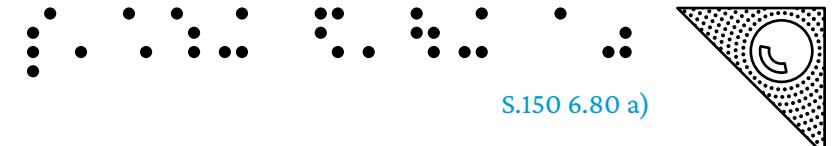
(4)



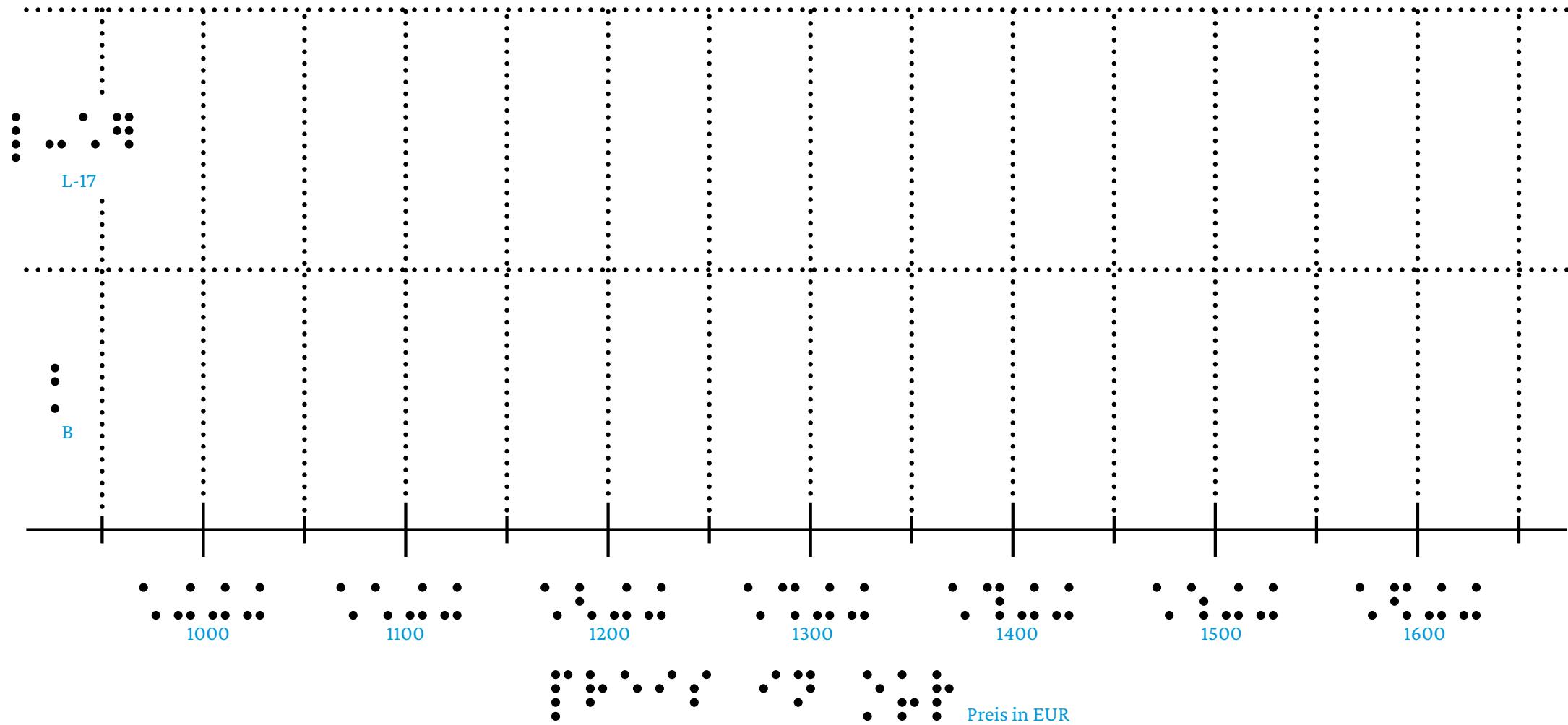
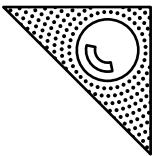




Ang. Mat. HAK4

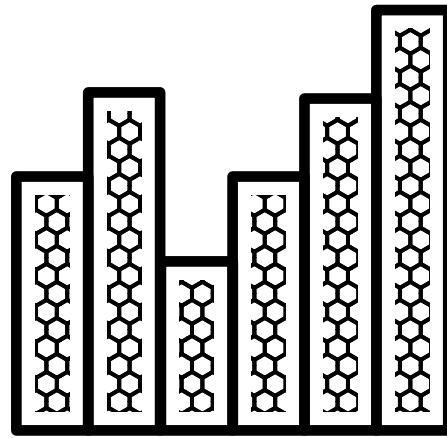


S.150 6.80 a)



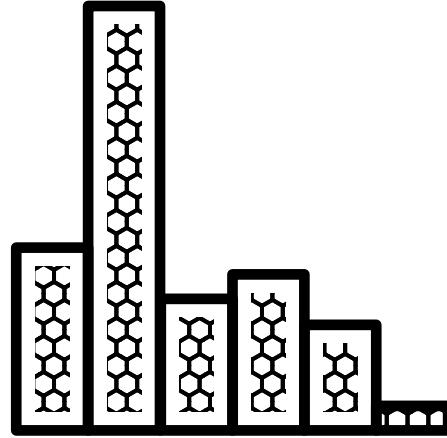
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Ang.Mat. HAK4



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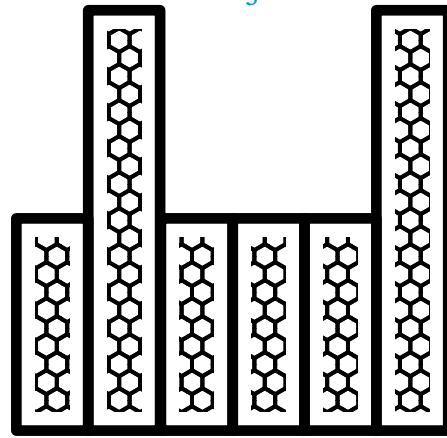
S.150 6.80 b)



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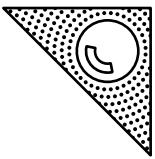
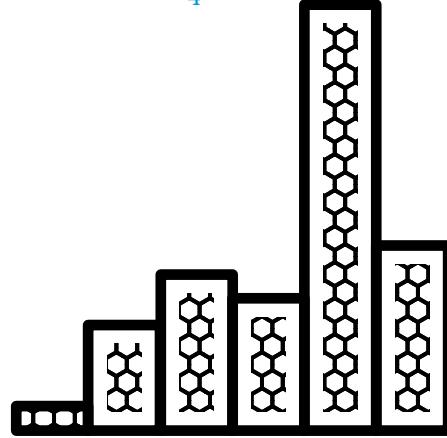
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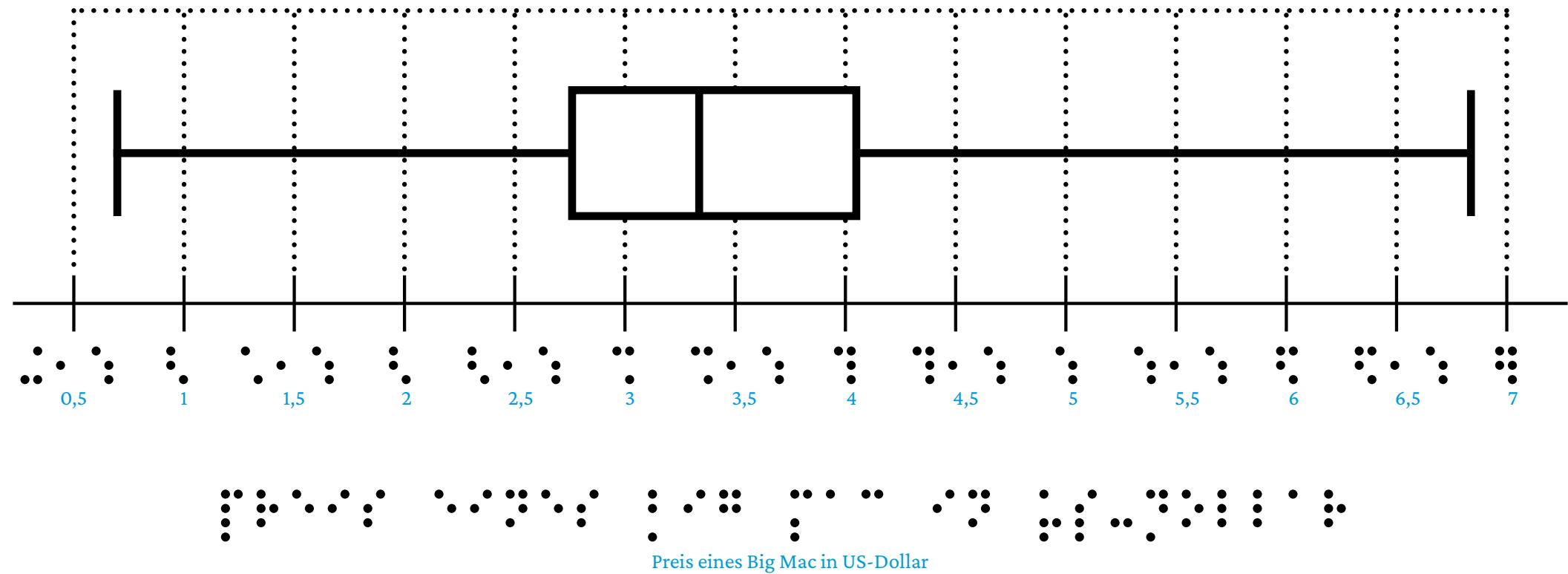
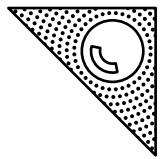


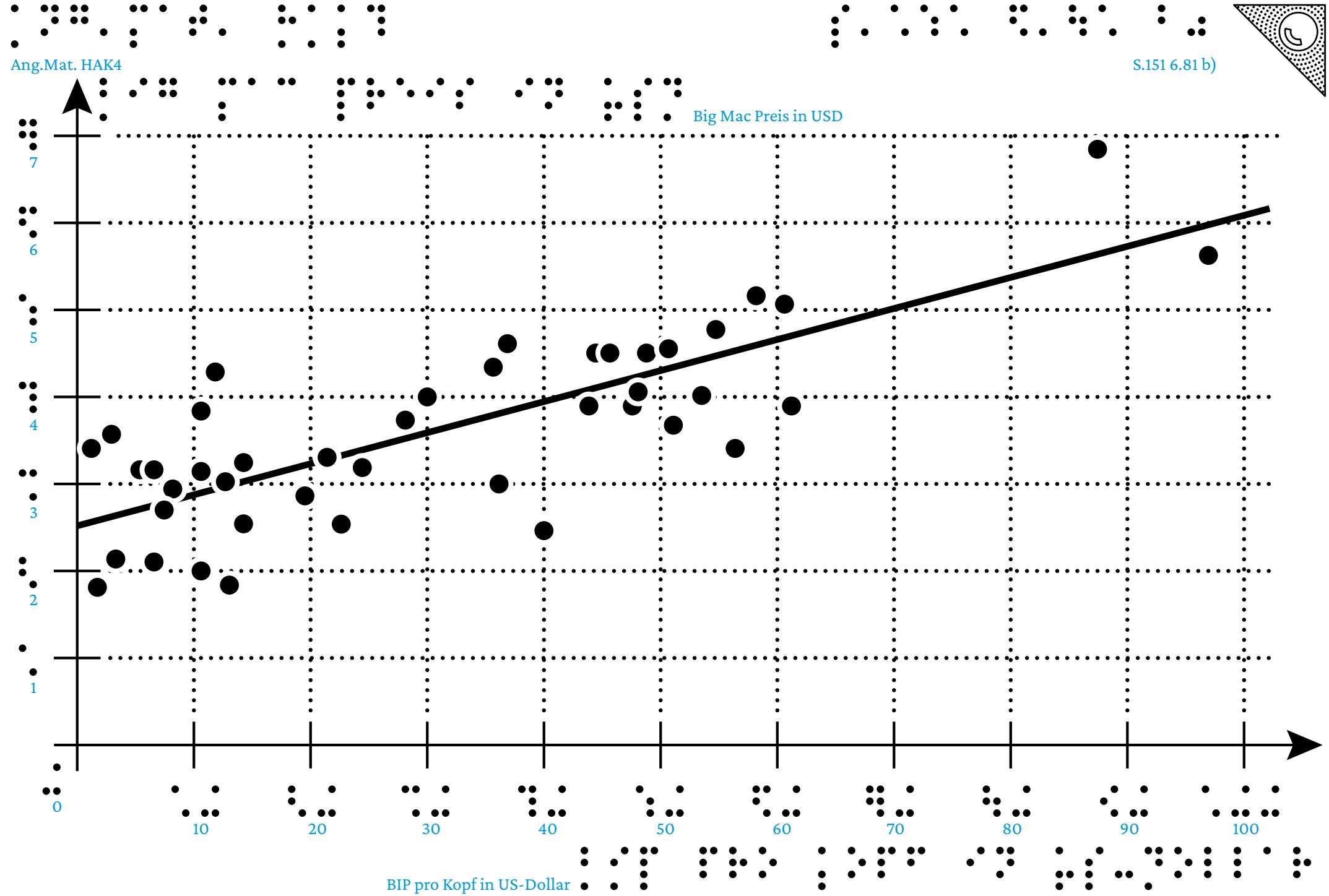
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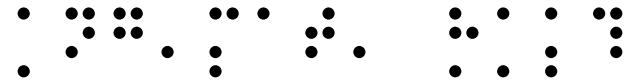
Ang. Mat. HAK4

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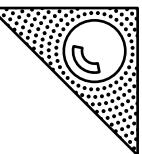
S.151 6.81 a)





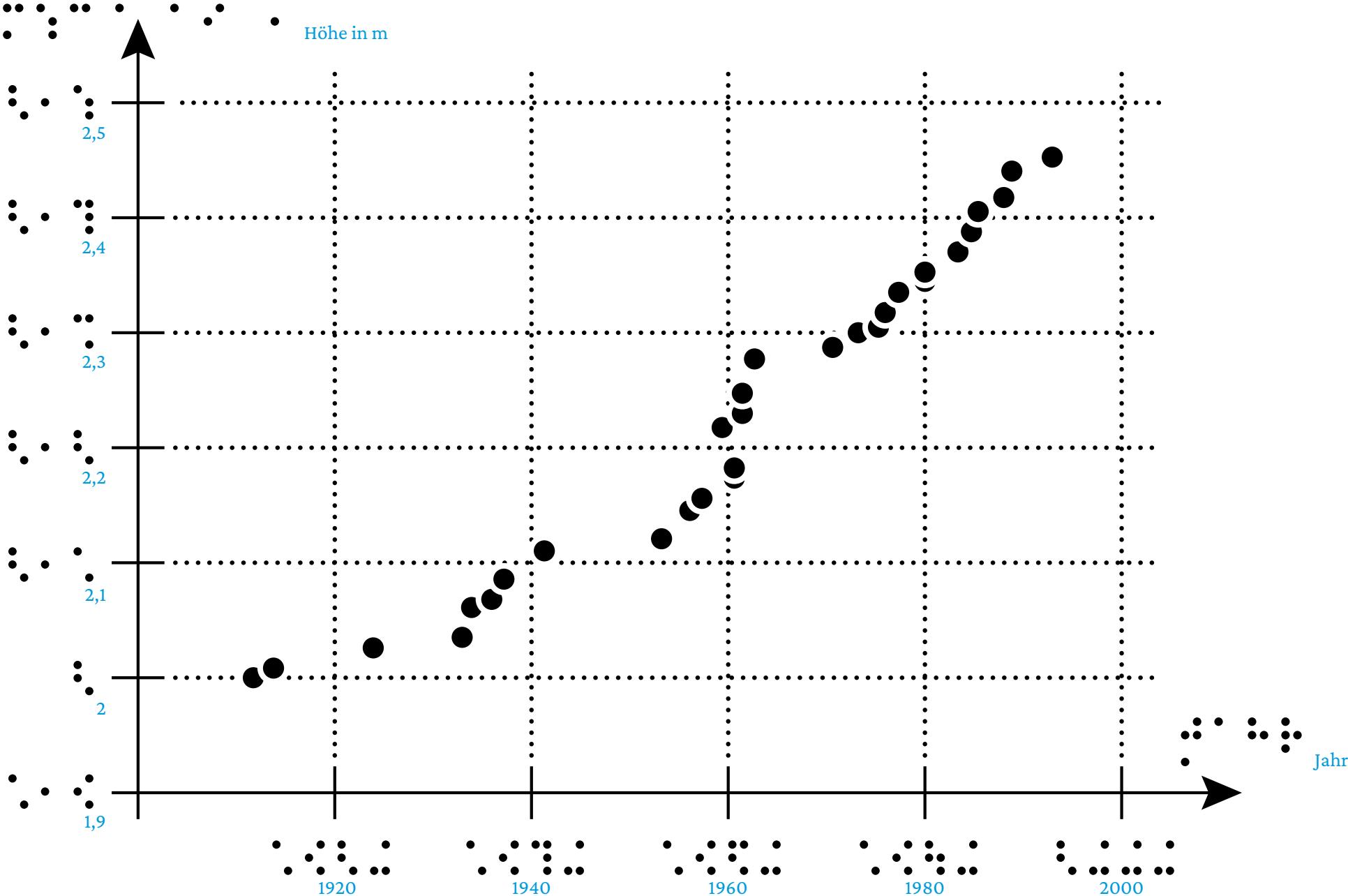


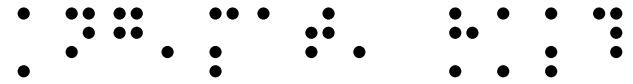
Ang.Mat. HAK4



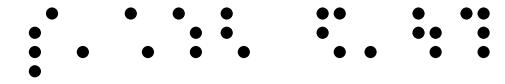
S.152 6.83

Höhe in m

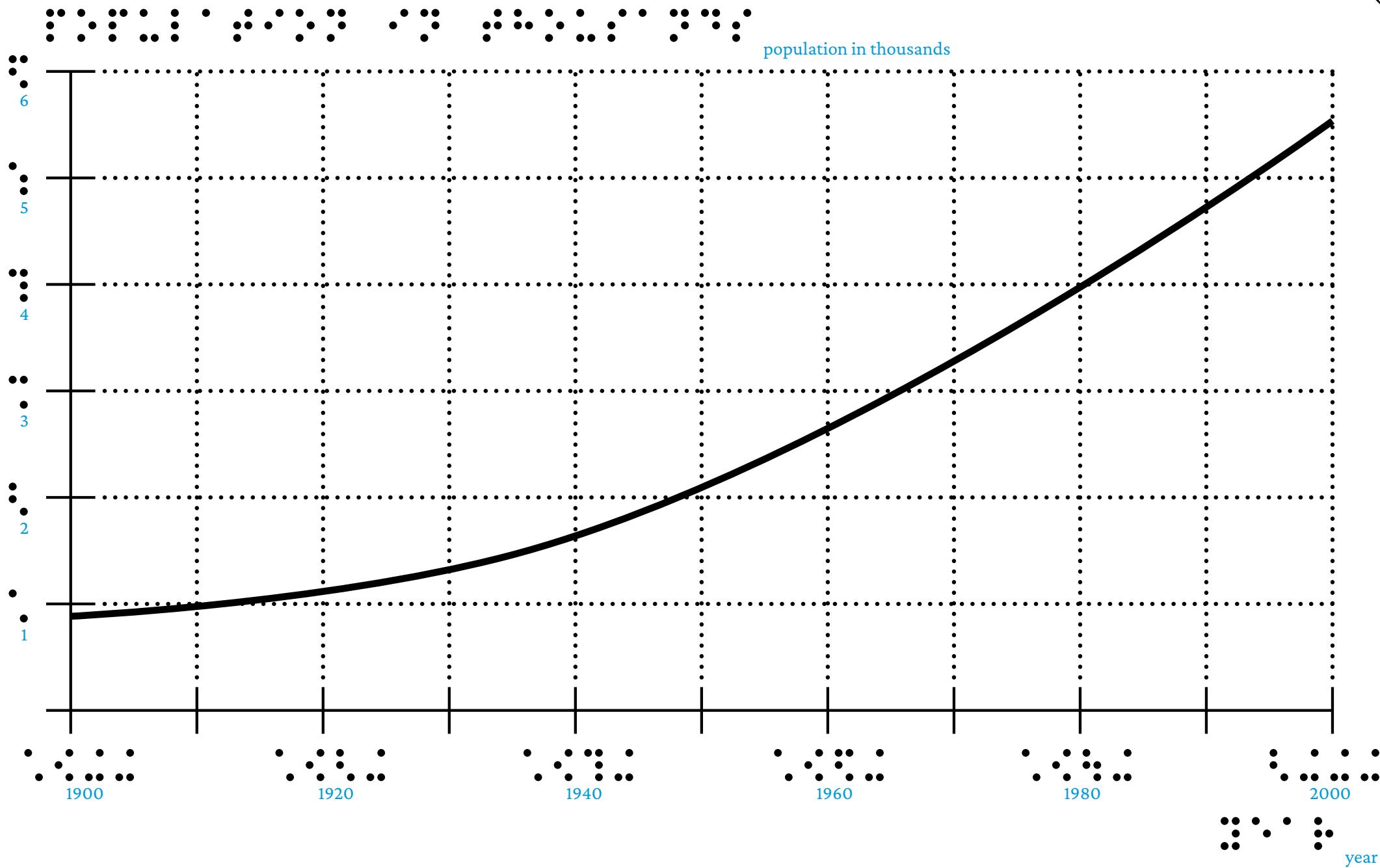
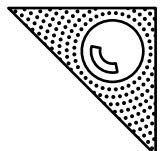


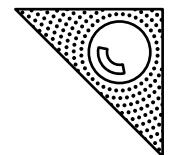
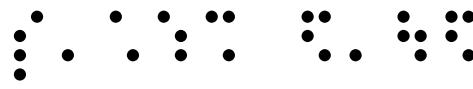
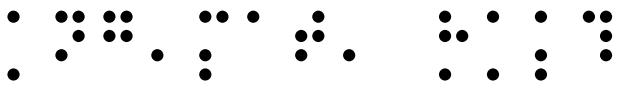


Ang.Mat. HAK4



S.152 6.84





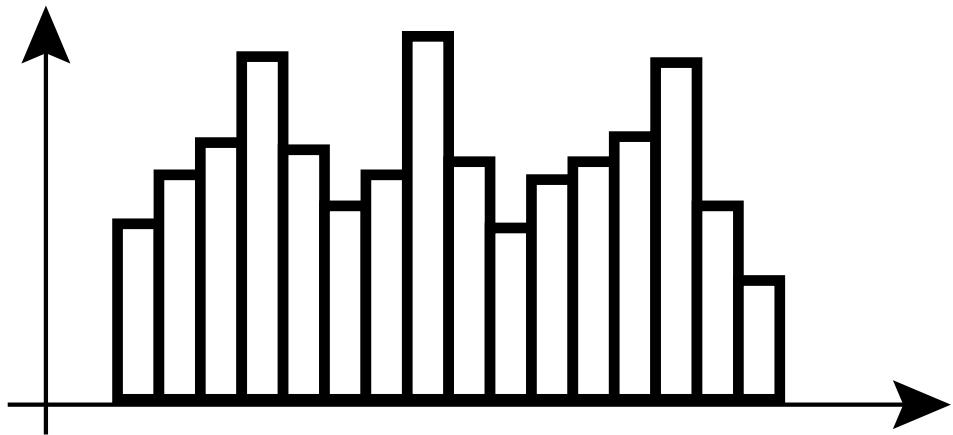
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a)



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h)

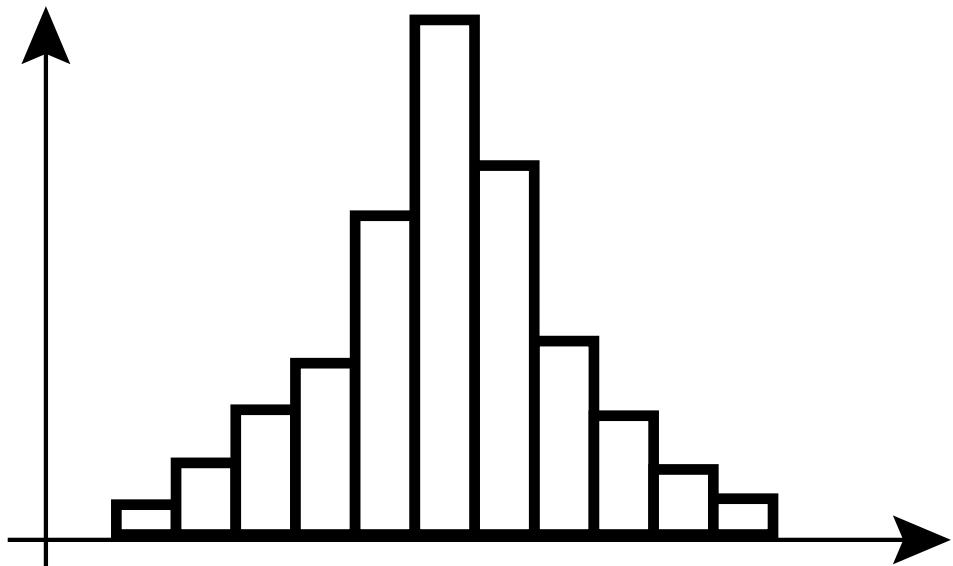
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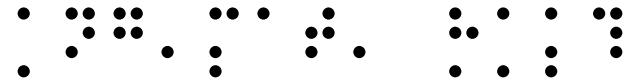
Abbildung 1



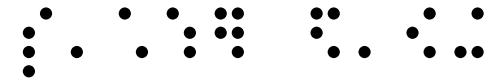
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Abbildung 2

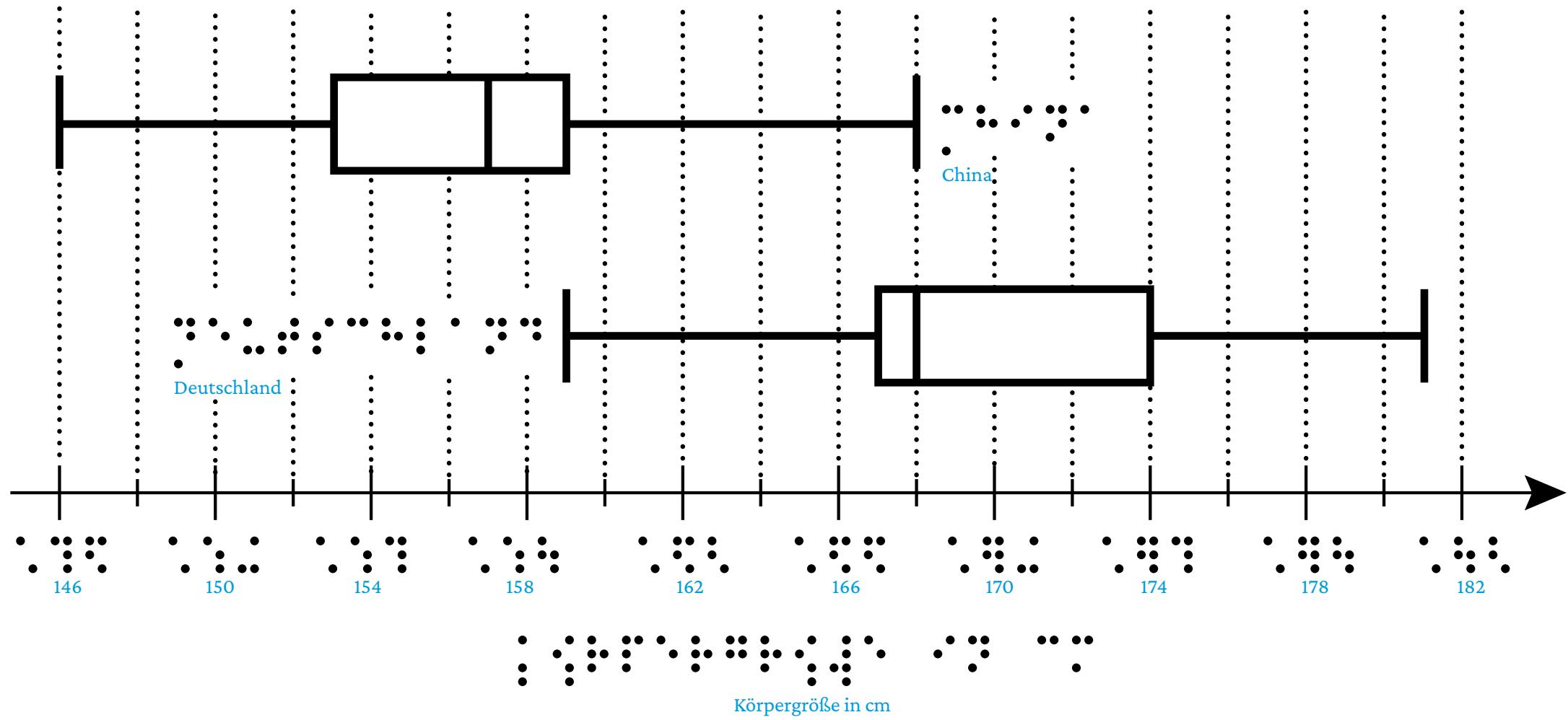
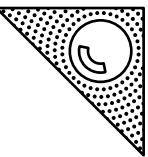


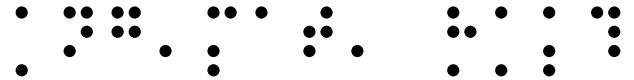


Ang. Mat. HAK4

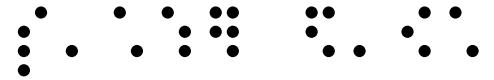


S.157 6.90

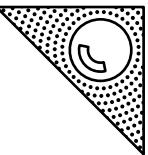




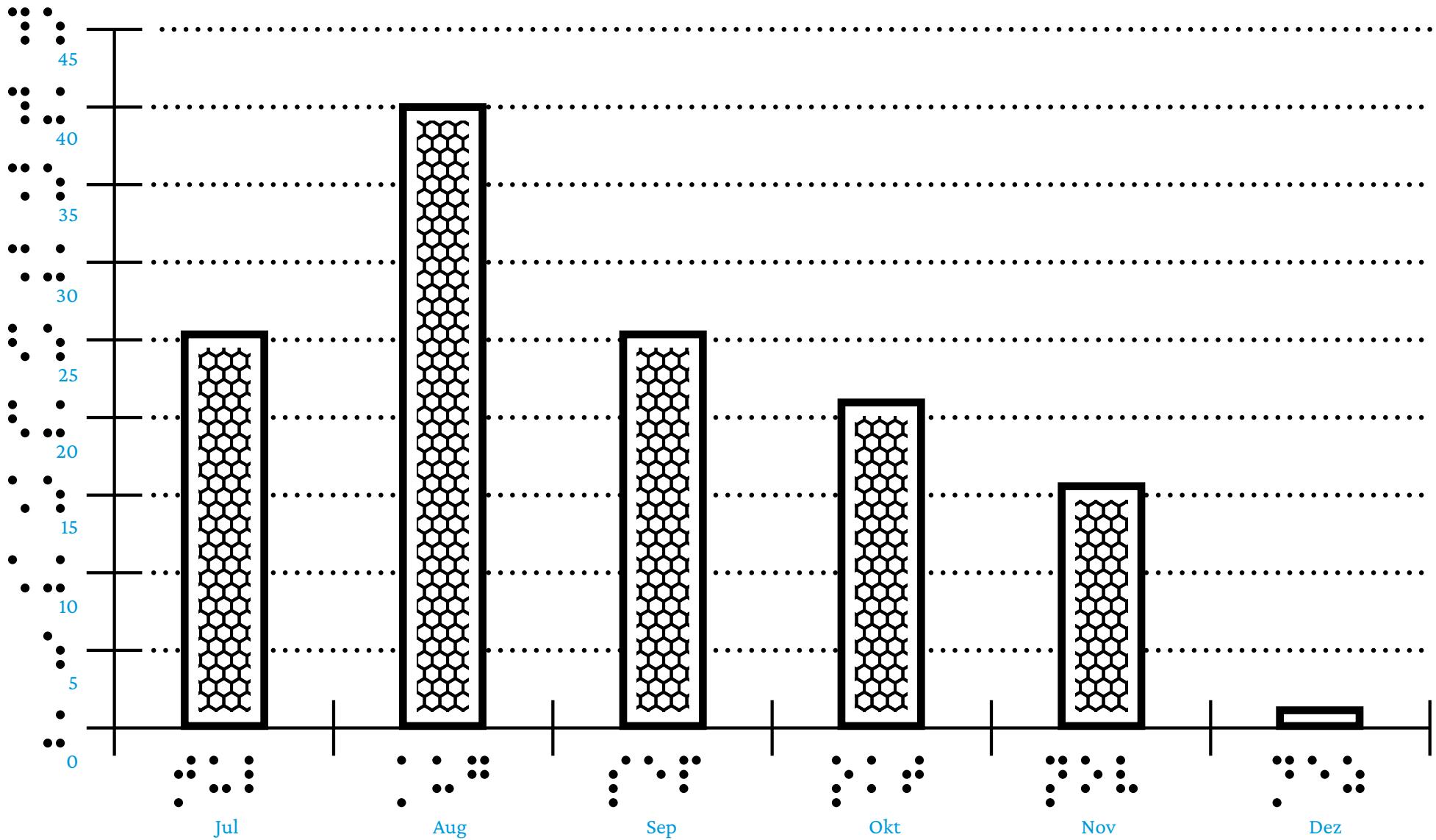
Ang. Mat. HAK4

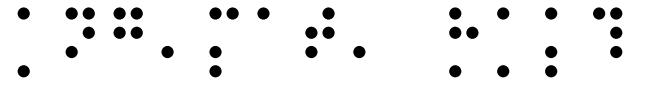


S.157 6.91

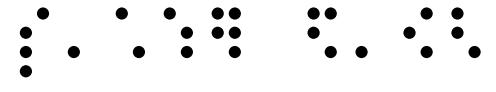


Gewinn in 1000 EUR

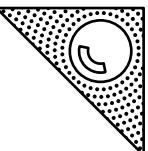




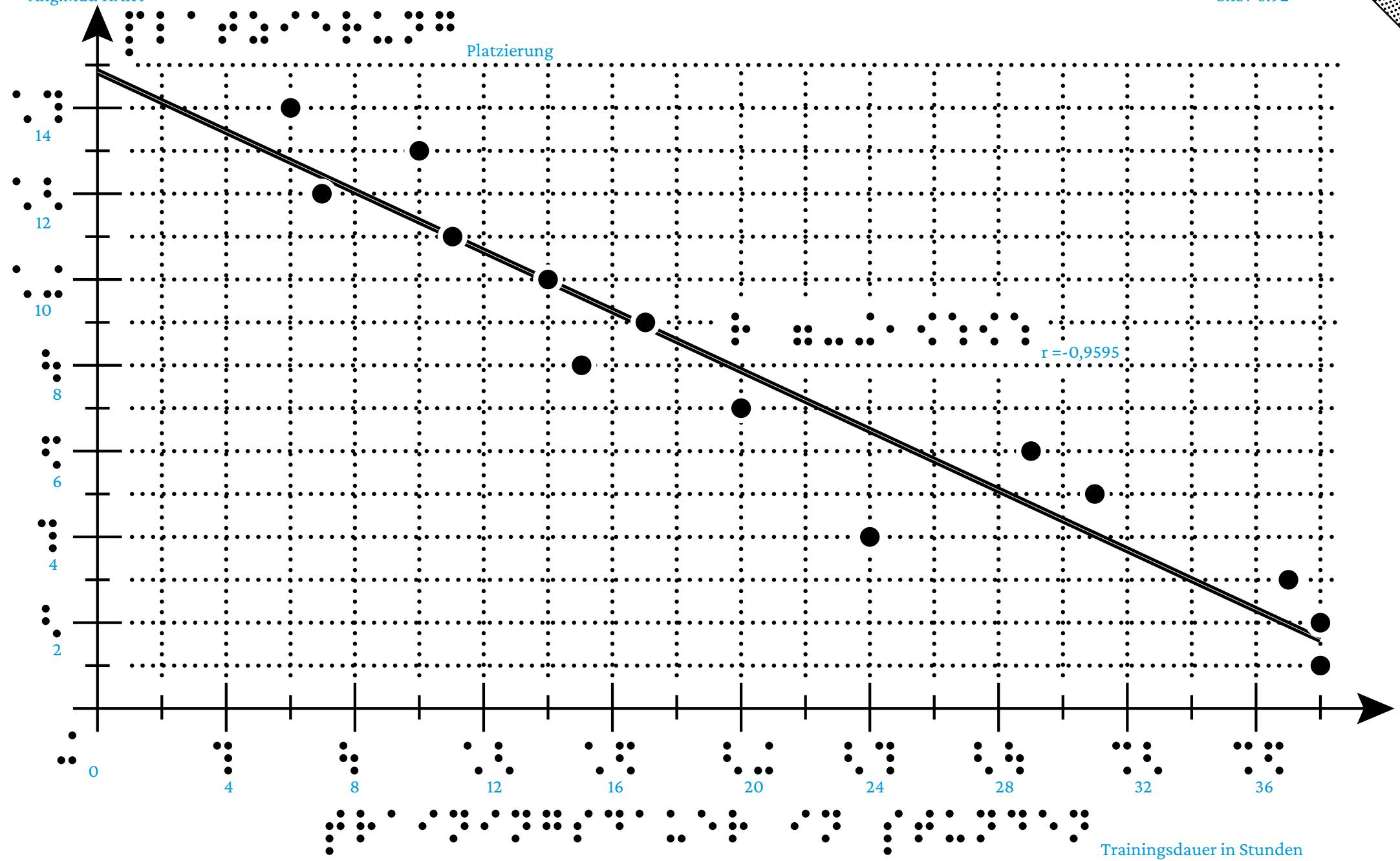
Ang. Mat. HAK4



S.157 6.92



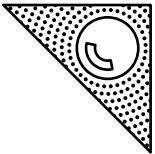
Platzierung



Trainingsdauer in Stunden

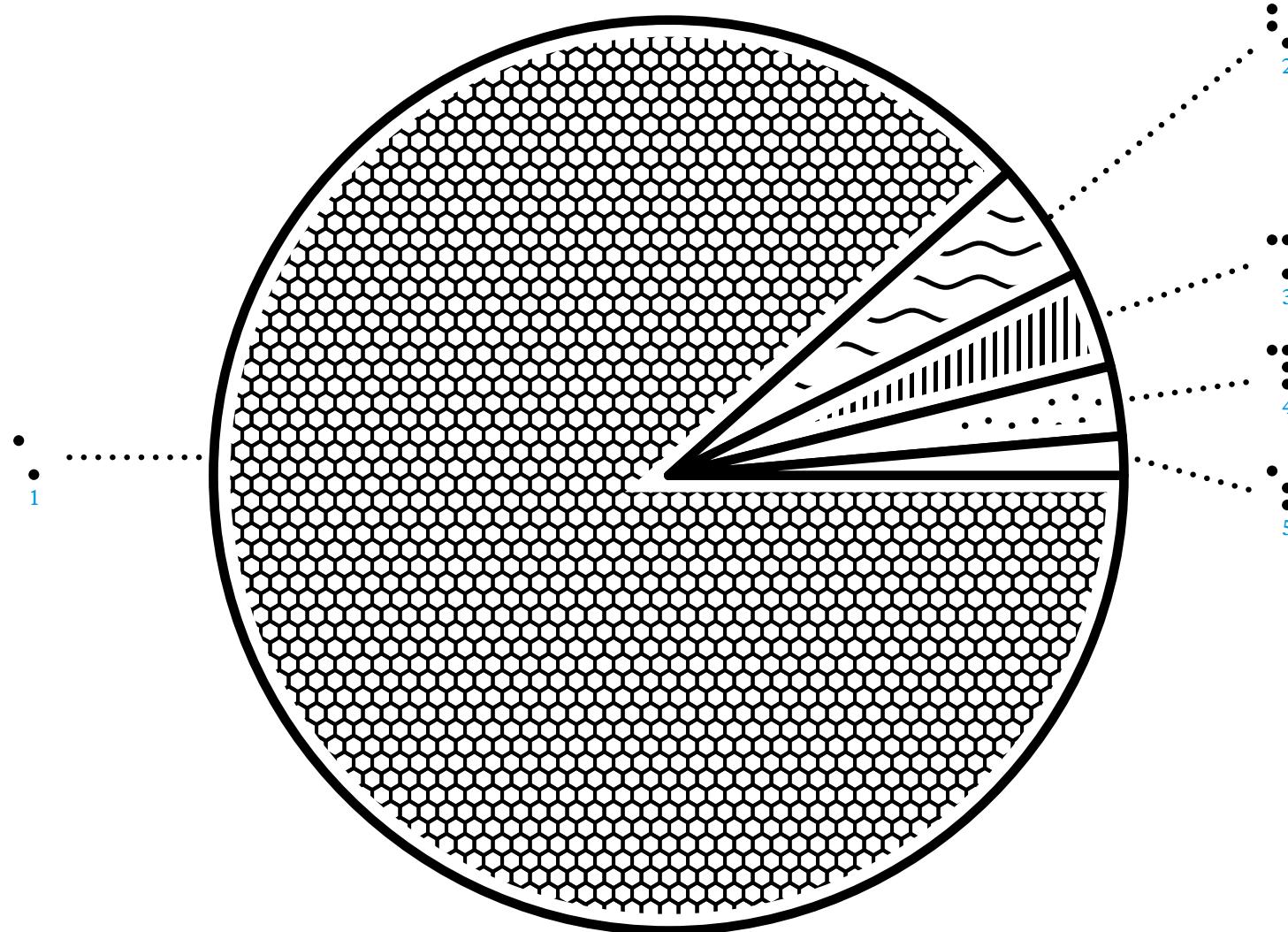
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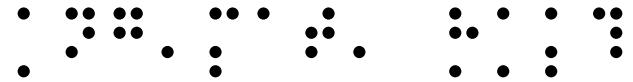
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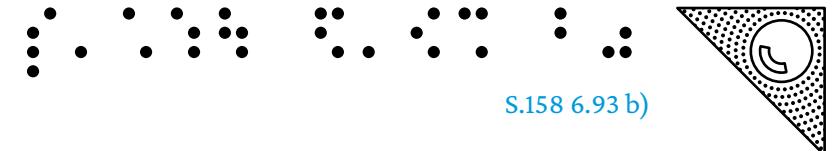
Ang.Mat. HAK4

S.158 6.93 a)

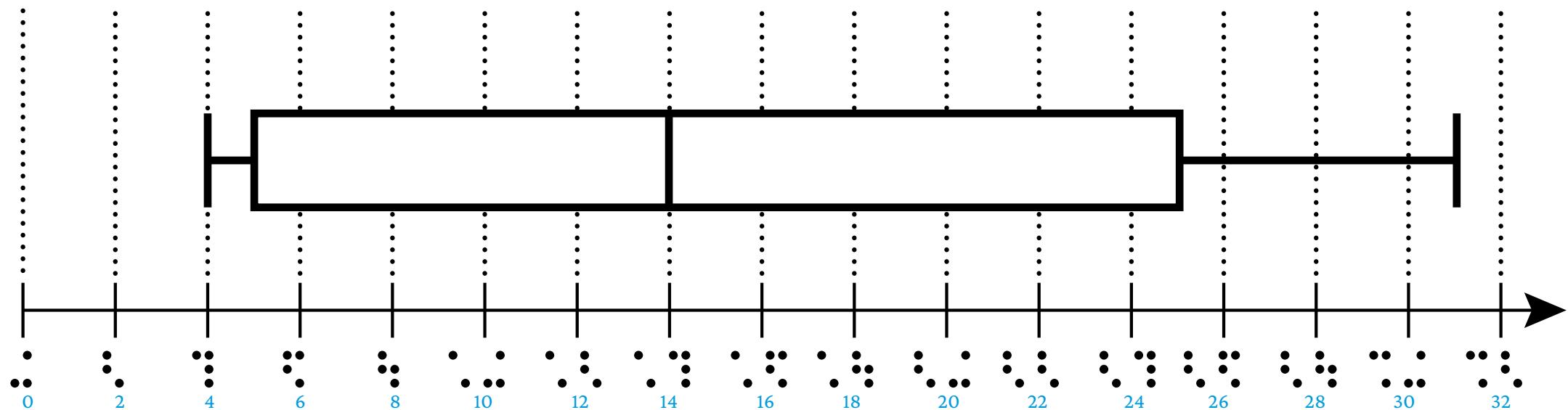
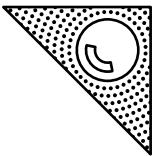


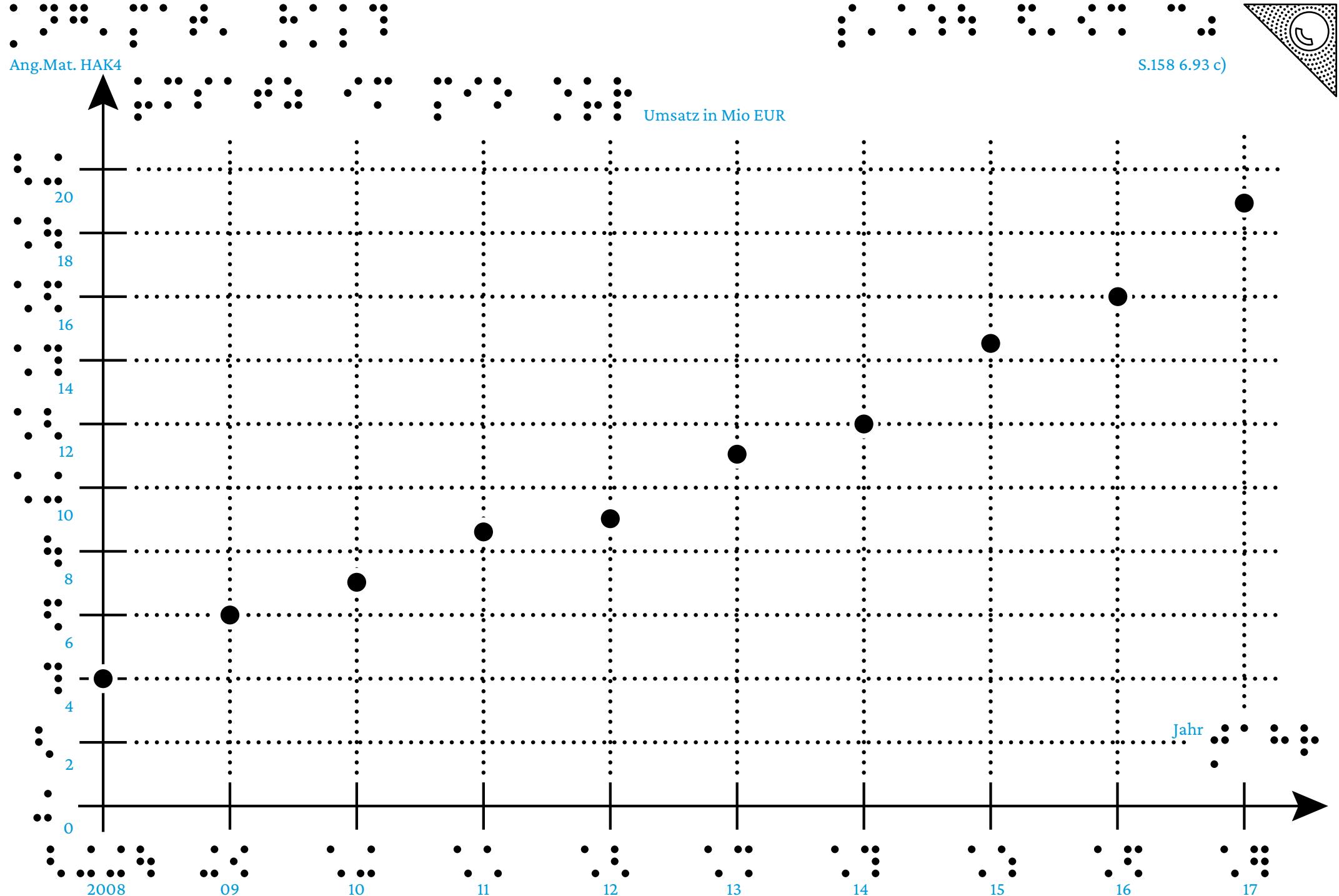


Ang.Mat. HAK4



S.158 6.93 b)





S.158 6.93 c)

