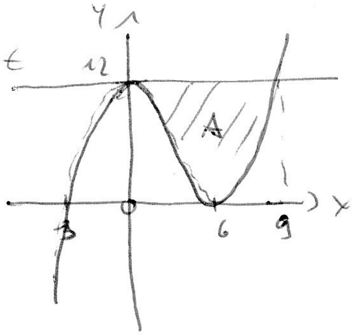
Mater H17

1. $f(x) = \frac{1}{9}x^3 - x^2 + c$



a) $f(-3) = 0 \Rightarrow \underline{c = 12}$

b) NST: $x_1 = -3 \quad x_2 = 6$ (doppelt)

Extr. Min$(6|0)$ Max$(0|12)$

WP WP$(3|6)$

c) $t: \; f'(0) = 0 \Rightarrow t: y = 12 \\ f(9) = 12 \Big\} = ✓$

d) $A = \int_0^9 (t - f)\,dx = \int_0^9 \left(-\frac{1}{9}x^3 + x^2\right)dx = \left[-\frac{1}{36}x^4 + \frac{1}{3}x^3\right]_0^9 = \underline{\frac{243}{4}}$

2. $A(2|5|8) \quad B(5|7|12) \quad C(1|9|15)$

a) $\vec{AB} = \begin{pmatrix} 3 \\ 2 \\ 4 \end{pmatrix} \quad AB = \sqrt{29} \qquad \cos\beta = \frac{\vec{BA} \cdot \vec{BC}}{BA \cdot BC} = \frac{-\begin{pmatrix} 3 \\ 2 \\ 4 \end{pmatrix}\begin{pmatrix} -4 \\ 2 \\ 3 \end{pmatrix}}{\sqrt{29}\;\sqrt{29}} = \frac{-4}{29} \Rightarrow \underline{\beta = 97{,}9°}$

b) $\vec{D} = \vec{A} + \vec{BC} = \begin{pmatrix} -2 \\ 7 \\ 11 \end{pmatrix} \quad D(-2|7|11)$ $\qquad AB = BC$ also Rhombus

c) $A = AB\,BC \sin\beta = 29 \sin 97{,}9° = \underline{28{,}72}$

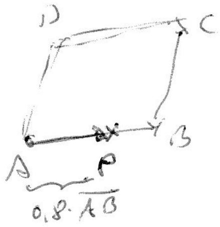
d) $B\cancel{X} = CY \qquad Y(0|y|0)$

$5^2 + (y-7)^2 + 12^2 = 1^2 + (y-9)^2 + 15^2$

$y = 89/4 \qquad \underline{Y(0|\frac{89}{4}|0)}$

e) $E: \; \vec{x} = \begin{pmatrix} 2 \\ 5 \\ 8 \end{pmatrix} + s\underset{AB}{\begin{pmatrix} 3 \\ 2 \\ 4 \end{pmatrix}} + t\underset{BC}{\begin{pmatrix} -4 \\ 2 \\ 3 \end{pmatrix}} = \begin{pmatrix} 4{,}4 \\ 6{,}6 \\ z \end{pmatrix}$

$s = 0{,}8$
$t = 0$
$\underline{z = 11{,}2}$



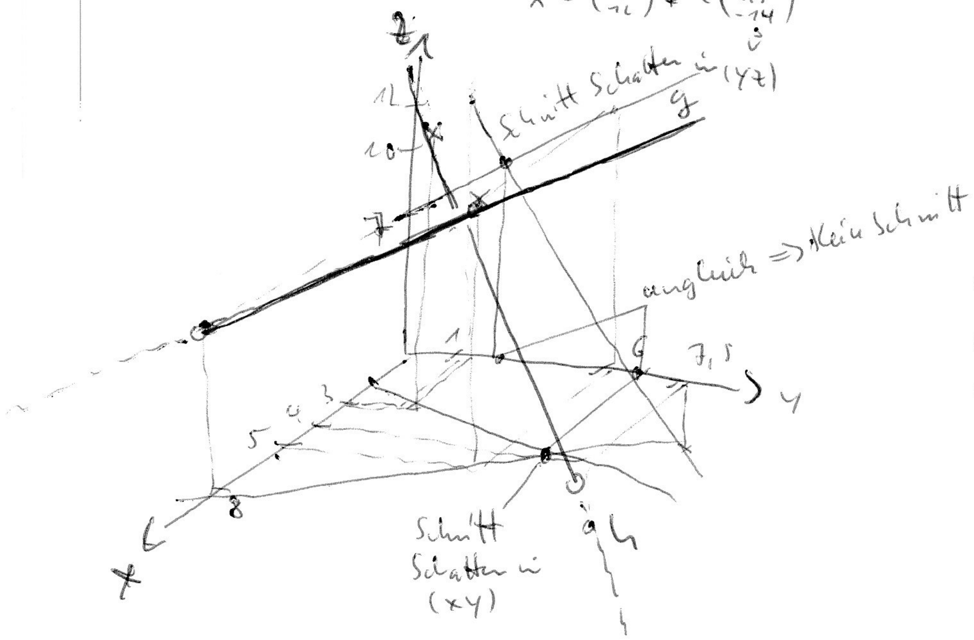
P auf Rand auf AB

3.1. Median = 4,5
Mittelwert = 4,25
Standardabweichung = 0,713

3.2. $g: \; \vec{x} = \begin{pmatrix} 5 \\ 6 \\ 10 \end{pmatrix} + s\underset{\vec{u}}{\begin{pmatrix} 1 \\ -2 \\ -1 \end{pmatrix}}$ $\qquad h: P_1(3|1|12) \quad P_2(4|7{,}5|-2)$

$\vec{x} = \begin{pmatrix} 3 \\ 1 \\ 12 \end{pmatrix} + t\underset{\vec{v}}{\begin{pmatrix} 1 \\ 6{,}5 \\ -14 \end{pmatrix}}$

$\vec{u} \neq k\vec{v}$
nicht parallel
$s = g$ falsch $\Big\}$ windschief



Der Schnitt der Schatten der beiden Geraden in (xy) und (yz) kommt auf y-Achse nicht zur Deckung ⇒ kein Schnitt.

Mathe #17

4. 3 x rot $\left(\frac{1}{2}\right)$ 2 x gelb $\left(\frac{1}{3}\right)$ 1 x blau $\left(\frac{1}{6}\right)$

a) $P(\text{Kein blau}) = \frac{5}{6} = 83{,}3\%$

b) $P(\text{Kein blau}) = \left(\frac{5}{6}\right)^2 = \frac{25}{36} = 69{,}4\%$

c) $P(\text{zweimal gleich}) = \left(\frac{1}{2}\right)^2 + \left(\frac{1}{3}\right)^2 + \left(\frac{1}{6}\right)^2 = \frac{7}{18} = 38{,}9\%$

d) $P(\text{einmal rot}) = \binom{3}{1} \cdot \left(\frac{1}{2}\right)^1 \left(\frac{1}{2}\right)^2 = 3 \cdot \left(\frac{1}{2}\right)^3 = \frac{3}{8} = 37{,}5\%$

e) $P(\text{mind. einmal rot}) = 1 - P(\text{nie rot}) = 1 - \left(\frac{1}{2}\right)^3 = \frac{7}{8} = 87{,}5\%$

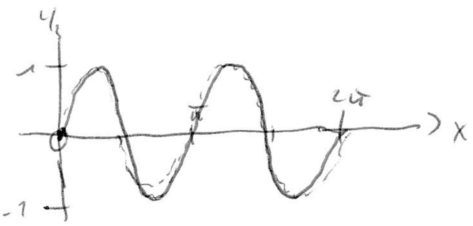
f) $P((rgb)) = 6 \cdot \frac{1}{2} \cdot \frac{1}{3} \cdot \frac{1}{6} = \frac{1}{6} = 16{,}7\%$

5.1. $\cos\alpha = \frac{\begin{pmatrix}-2\\-1\end{pmatrix}\begin{pmatrix}-1\\-2\end{pmatrix}}{\sqrt{5}\ \sqrt{5}} = \frac{4}{5}$

$\alpha = 36{,}9°$

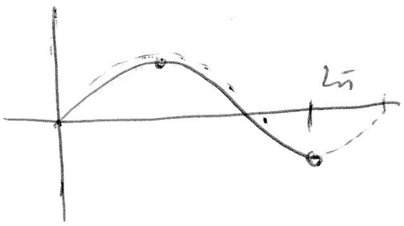
5.2. $f(x) = \sin(ax)$ $x \in [0; 2\pi]$ $a > 0$

a) $a = 2$



b) sin x hätte 2 Extrema, da Periode halbiert, wird es 4 Extrema

c)



$2\pi \mathrel{\hat=} \frac{3}{4}$ Periode

$\frac{3}{4} > a \geq \frac{1}{4}$

$2\pi = \frac{1}{4}$ Periode