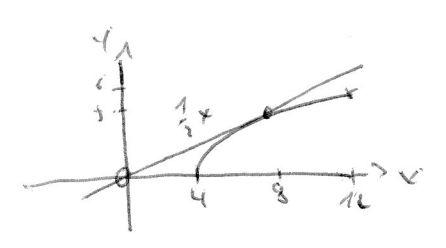


1. $f(x) = \sqrt{a(x-a)} \quad a > 0$

a) $x=a$
 b) $a=4$
 $f_4(x) = 2\sqrt{x-4}$



c) $f_4'(x) = \frac{1}{\sqrt{x-4}}$
 $f_4'(8) = \frac{1}{2} \quad t: y = \frac{1}{2}(x-8) + 4$
 $f(8) = 4 \quad y = \frac{1}{2}x \quad \checkmark$

d) $F(x) = \frac{2}{3} \sqrt{a(x-a)^3} \quad F'(x) = \frac{2}{3} \frac{1}{\sqrt{a(x-a)^3}} a^3 (x-a)^2 = \frac{a(x-a)^2}{(x-a)\sqrt{a(x-a)}} = \frac{(x-a)\sqrt{a}}{\sqrt{x-a}} = \sqrt{x-a}\sqrt{a} = \sqrt{a(x-a)} = f(x) \quad \checkmark$

e) $A = \int_4^{11} (t - f_4) dx = \left[\frac{1}{2}x^2 - \frac{2}{3}\sqrt{4(x-4)^3} \right]_4^{11} = \frac{105}{2} - \frac{28}{3}\sqrt{7}$

f) $f(2a) = \sqrt{a(2a-a)} = a$
 $f'(x) = \frac{a}{2\sqrt{a(x-a)}} \quad f'(2a) = \frac{a}{2\sqrt{a(2a-a)}} = \frac{1}{2}$
 $t: y = \frac{1}{2}(x-2a) + a$
 $y = \frac{1}{2}x$

2. $p = \frac{225}{750} = 30\%$

a) $P(\text{mind. 1 v. 3}) = 1 - P(\text{keine}) = 1 - 0.7^3 = 65.7\%$

b) $525: 40\% \checkmark$
 $750: 68\% \checkmark$

$\bar{F}: 525 \left\{ \begin{array}{l} 240V \\ 315V \end{array} \right.$
 $A: 750 \quad 510V$
 $F: 225 \left\{ \begin{array}{l} 30V \\ 185V \end{array} \right. \leftarrow$

} 240V

	F	\bar{F}	
V	4%	28%	32%
\bar{V}	26%	42%	68%
	30%	70%	

b) $P(F \text{ and } V) = P(F \cap V) = 4\%$

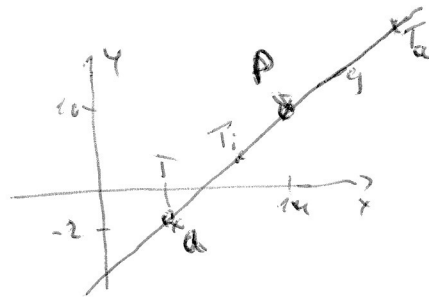
c) $P(F|V) = \frac{4\%}{32\%} = 12.5\%$

d) $P(F \cup V) = P(F) + P(V) - P(F \cap V) = 30\% + 32\% - 4\% = 58\%$

e) $P((F \cap V) \cup (F \cap \bar{V})) = 4\% + 42\% = 46\%$ (Schrittweise lesen)

3. $P(14|10)$ $Q(5|-2)$

$\vec{r} = \begin{pmatrix} 17 \\ 6 \end{pmatrix} + \lambda \begin{pmatrix} 3 \\ 4 \end{pmatrix}$



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a) $\lambda = 1 \rightarrow P$ $\lambda = -2 \rightarrow Q$

b) $\vec{r}_+ = \frac{2\vec{r}_P + 1\vec{r}_Q}{2+1}$ $\vec{r}_{T_1} = \begin{pmatrix} 17 \\ 6 \end{pmatrix}$

$\vec{r}_{T_2} = \begin{pmatrix} 23 \\ 12 \end{pmatrix}$

c) $2|\vec{r}_P \times \vec{r}_Q| = |\vec{r}_Q \times \vec{r}_P|$

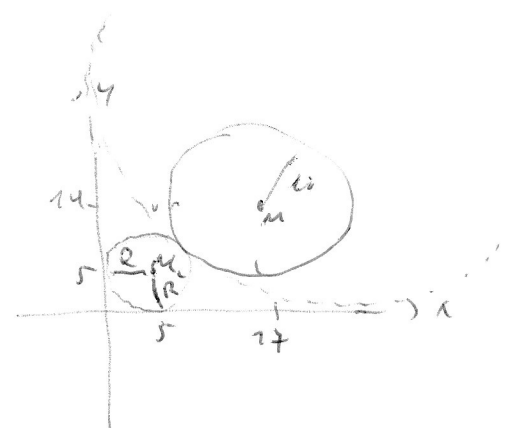
$4 \left| \begin{pmatrix} x-14 \\ y-10 \end{pmatrix} \right|^2 = \left| \begin{pmatrix} x-5 \\ y+2 \end{pmatrix} \right|^2$

$4[(x-14)^2 + (y-10)^2] = (x-5)^2 + (y+2)^2$

$x^2 - 34x + 4^2 - 20y = -38x + 1 + 17^2 + 14^2$

$(x-17)^2 + (y-14)^2 = 10^2$

$M(17|14)$ $R=10$



d) $\text{Kor-Achsen schneiden: } x_{M_2} = y_{M_1} = R_2$

$M_1 M_2 = R_2 + R_1$

$\left| \begin{pmatrix} 17-R_1 \\ 14-R_1 \end{pmatrix} \right|^2 = (R_1 + 10)^2$

e) $(17-R_1)^2 + (14-R_1)^2 = (R_1 + 10)^2$ 4 (2) Kreis

$\frac{R_2 = 5}{R_1 = 7}$ $M_2(5|5)$

4. a) $a=2$; $c=2$; $h=2$

$A = \frac{a+c}{2} h = (1+\sin \alpha) \cdot 2 = 1,16$

ii) $u \text{ BC} = AD = \sqrt{(a-\sin \alpha)^2 + 2c^2} = \sqrt{1-2\sin \alpha + 4 + 4} = \sqrt{2-2\sin \alpha}$

iii) $u = a + c + 2 \text{ BC} = 2 + 2 \sin \alpha + 2\sqrt{2-2\sin \alpha}$

$u' = -2 \sin \alpha + \frac{2}{\sqrt{2-2\sin \alpha}} (2 \cos \alpha) = \frac{-2 \sin \alpha + 2\sqrt{2-2\sin \alpha} + 2 \cos \alpha}{\sqrt{2-2\sin \alpha}} = 0$

b) $\int_1^2 (2x-3) dx = \int_1^{1.5} -(2x-3) dx + \int_{1.5}^2 (2x-3) dx = \left[-x^2 + 6x \right]_1^{1.5} + \left[x^2 - 3x \right]_{1.5}^2 = \frac{1}{2}$

c) $y = e^{2x}$ $y' = \tan 30^\circ$ $2e^{2x} = \frac{1}{3}\sqrt{3}$ $(x = \frac{1}{2} \ln(\frac{1}{6}\sqrt{3}))$ $y = \frac{1}{e}\sqrt{3}$

d) $f(0) = 0 = f'(0) = f''(0)$ $f'(-1) = 0$ $f(-1) = -1$
 $\rightarrow ax^4 + bx^3 \rightarrow -4a + 3b = 0$ $a - b = -1 \rightarrow a = 6$ $b = 8$ $f(x) = 6x^4 + 8x^3$

e) $M(1|-3)$ $m_g = -\frac{4}{3} \rightarrow m = \frac{3}{4}$ $h: y = \frac{3}{4}(x-1) - 3$ $(-3|-6)$
 $\vec{n}_g = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$ $|\vec{n}| = 5 = R$ $\wedge h: (x-1)^2 + (y+3)^2 = 25$ $(5|0)$
 $\vec{r}_1 = \begin{pmatrix} 1 \\ -3 \end{pmatrix} + \begin{pmatrix} 4 \\ 3 \end{pmatrix} = \begin{pmatrix} 5 \\ 0 \end{pmatrix}$ $\vec{r}_2 = \begin{pmatrix} 1 \\ -3 \end{pmatrix} - \begin{pmatrix} 4 \\ 3 \end{pmatrix} = \begin{pmatrix} -3 \\ -6 \end{pmatrix}$