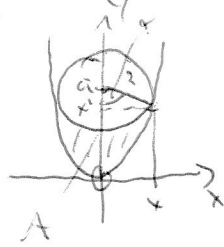


1.



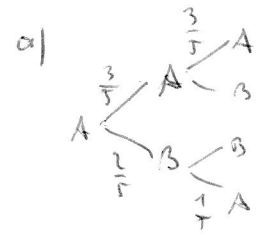
Steigung in $(x|x^L) : 2x$
 $a-x^L : \frac{a-x^L}{x}$

$2x \cdot \frac{a-x^L}{x} = 1$
 $\frac{2x}{>0} \cdot \frac{a-x^L}{>0} = 1$
 $\rightarrow a-x^L = \frac{1}{2}$

Kreis: $(a-x^L)^2 + x^L = r^2$
 $x^L = \frac{15}{4}$
 $x = \frac{1}{2}\sqrt{15}$
 $\rightarrow a = \frac{17}{4}$

$A = 2 \cdot (A_{\text{Trapez}} - A_{\text{sekt}} - A_{\text{Parabel}})$
 Symbolik
 $= 2 \cdot \left(\frac{a+x^L}{2} \cdot x - \frac{\alpha}{360} \cdot r^2 \pi - \int_0^x x^L dx \right)$
 $\tan \alpha = \frac{x}{a-x^L} = \frac{\frac{1}{2}\sqrt{15}}{\frac{1}{4}}$
 $\alpha = 75,52^\circ$
 $= 2 \cdot \left(\frac{17/4 + 15/4}{2} \cdot \frac{1}{2}\sqrt{15} - \frac{75,52}{360} \cdot 4\pi - \left[\frac{1}{3}x^3 \right]_0^{\frac{1}{2}\sqrt{15}} \right)$
 $= 5,4$

2. $P_{AB} = \frac{2}{5}$ $P_{BA} = \frac{1}{5}$ $P_{AA} = \frac{3}{5}$ $P_{BB} = \frac{4}{5}$ $t=0$ i A



$P(\text{A nach 2 Sekunden}) = \left(\frac{3}{5}\right)^2 + \frac{2}{5} \cdot \frac{1}{5} = \frac{11}{25} = 44\%$

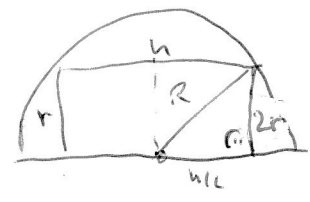
b) $P(\text{mind. einmal in B}) > 95\%$
 $1 - P(\text{nur in A}) > 0,95$
 $\left(\frac{3}{5}\right)^n < 0,05$
 $n > \log_{3/5} 0,05 = 9,01$

Nach 10 Sekunden



In AAAB wechselt er nur auf B, aber nicht wieder zurück zu A: $(3/5)^3 \cdot 2/5$
 In den anderen Fällen wechselt er einmal von A zu B: $2/5$, einmal von B zu A: $1/5$ und zweimal bleibt er auf A: $3/5$
 also: $2/5 \cdot 1/5 \cdot (3/5)^2$
 insgesamt: 11,5%

3.



$R^2 = \left(\frac{h}{2}\right)^2 + (2h)^2$
 $r^2 = \frac{1}{4}R^2 - \frac{1}{16}h^2$
 $= \frac{1}{16}(4R^2 - h^2)$

$V = r^2 \pi \cdot h \rightarrow \max$
 $V = \frac{\pi}{16}(4R^2 - h^2) \pi h$ $h \in [0, 2R]$
 $= \frac{\pi^2}{16}(-h^3 + 4R^2 h)$
 $V' = \frac{\pi^2}{16}(-3h^2 + 4R^2)$
 $V'' = \frac{\pi^2}{16}(-6h)$

3. $V' = 0$
 $h = \frac{2}{3}\sqrt{3}R$ $r = \frac{1}{3}\sqrt{6}R$

Pass F17

$V''(h) < 0 \Rightarrow \text{Max}$

$\frac{V_{\pm}}{V_{\text{alt}}} = \frac{\pi r^2 h}{\frac{2}{3}\pi R^3} = \frac{\frac{1}{9}\pi R^2 \cdot \frac{2}{3}\sqrt{3}R}{\frac{2}{3}\pi R^3} = \frac{\frac{1}{6}\sqrt{3}}{1} = 28,9\%$

Ränder D: $V(0) = 0$
 $V(R) = 0$

4. $g_1: 3x - ay + a^2 + 4a = 0$

$g_2: (a-7)x + 4y - 8a = 0$

$a \neq 0$

a) $a=1$
 $3x - y + 5 = 0$
 $-6x + 4y - 8 = 0$
 $S(-2|-1)$

b) $D = \begin{vmatrix} 3 & -a \\ a-7 & 4 \end{vmatrix} = 12 + a(a-7) = 0$
 $a=3$
 $a=4$

$a=3: D_1 = \begin{vmatrix} -21 & -3 \\ 24 & 4 \end{vmatrix} \neq 0$

parallel

$D_2 = \begin{vmatrix} 3 & -21 \\ -4 & 24 \end{vmatrix} \neq 0$

$a=4: D_1 = \begin{vmatrix} -32 & 4 \\ 32 & 4 \end{vmatrix} = 0$

identisch

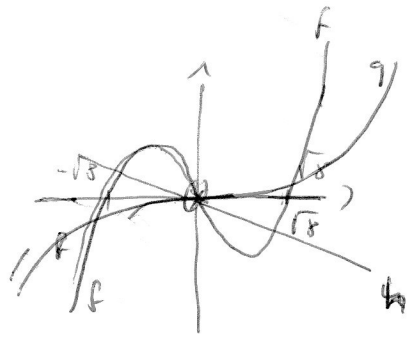
$D_2 = \begin{vmatrix} 3 & -32 \\ -32 & 32 \end{vmatrix} = 0$

c) $\vec{n}_1 \cdot \vec{n}_2 = 0$
 $\begin{pmatrix} 3 \\ -a \end{pmatrix} \cdot \begin{pmatrix} a-7 \\ 4 \end{pmatrix} = 0$

$3(a-7) - 4a = 0$
 $a = -21$

5. $f(x) = x^3 - 8x = x(x-8)(x+8)$

$g(x) = \frac{1}{3}x^3$



$f = g$

$\frac{8}{3}x^3 - 8x = 0$

$8x(\frac{1}{3}x - 1)(\frac{1}{3}x + 1) = 0$

$x=0 \quad x = \pm 3$

a) $A = \int_0^3 (g-f) dx = \left[4x^2 - \frac{2}{3}x^4 \right]_0^3 = 18$

b) $y = mx \quad m \in \mathbb{R}^-$

$x^3 - 8x = mx$

$x(x^2 - 8 - m) = 0$

$x=0 \quad x = \pm \sqrt{8+m}$

$A = \int_0^{\sqrt{8+m}} (g-f) dx$

$A = \left[\frac{1}{2}(m+8)x^2 - \frac{1}{4}x^4 \right]_0^{\sqrt{8+m}}$

$A = \frac{1}{2}(m+8)^2 - \frac{1}{4}(m+8)^2$

$A = \frac{1}{4}(m+8)^2$

$m_1 = -2$
 $(m_2 = -14)$