Mathe GF
HA1

1. a) $f=0$

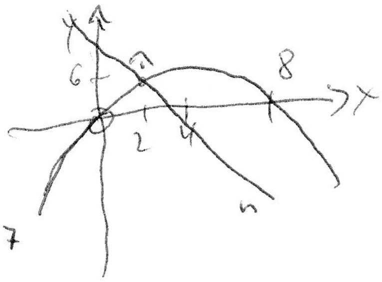
$x_1=0 \quad x_2=8$

$f'=4-x$

$f'(2)=2 \xrightarrow{t} -\frac{1}{2}$

$n: y=-\frac{1}{2}(x-2)+6=-\frac{1}{2}x+7$

$f(2)=6$



b) y-Achse: 6, x-Achse: 14 $\Big\}$ $\frac{1}{2}\cdot 6\cdot 14 = 42$

c) $F(x)=2x^2-\frac{1}{6}x^3+c$

$F(2)=8-\frac{8}{6}+c=0 \rightarrow \underline{c=-\frac{20}{3}}$

d) $f'(x)=-\frac{1}{2}$

$\underline{x=\frac{9}{2}} \quad y=\frac{63}{8}$

$n': y=-\frac{1}{2}(x-\frac{9}{2})+\frac{63}{8}$

$=-\frac{1}{2}x+\frac{81}{8}$

um $\frac{81}{8}-7=\underline{\frac{25}{8}}$

2. $A(-1|1|-4) \quad B(-4|5|2) \quad C(5|4|6)$

a) $\vec{AB}=\begin{pmatrix}-3\\4\\6\end{pmatrix} \quad \vec{AC}=\begin{pmatrix}6\\3\\10\end{pmatrix} \quad \vec{AB}\neq k\cdot\vec{AC}$ nicht kollinear, nicht auf einer Geraden also Ebene.

$E: \vec{x}=\begin{pmatrix}-1\\1\\-4\end{pmatrix}+s\begin{pmatrix}-3\\4\\6\end{pmatrix}+t\begin{pmatrix}6\\3\\10\end{pmatrix}$

b) x-Achse: $y=0$; $z=0 \Rightarrow$ $\left.\begin{array}{l}s=-1\\t=1\end{array}\right\}$ $x=8$

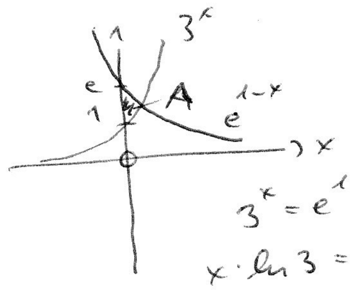
c) $\vec{BC}=\begin{pmatrix}9\\-1\\4\end{pmatrix}$ $BC^2=98$

$AB^2=61$

$AC^2=145 \rightarrow \beta$ Seiten ~ sin Winkel sin monoton steigend.

$\cos\beta=\frac{\vec{BC}\cdot\vec{BA}}{BC\cdot BA}=\frac{\begin{pmatrix}9\\-1\\4\end{pmatrix}\cdot\begin{pmatrix}3\\-4\\-6\end{pmatrix}}{\sqrt{98}\sqrt{61}}=\frac{27+4-24}{\sqrt{98}\sqrt{61}}=\frac{7}{\sqrt{98}\sqrt{61}} \Rightarrow \underline{\beta=84{,}8°}$

d) $\vec{r}_D=\vec{r}_A+\vec{BC}=\begin{pmatrix}8\\0\\0\end{pmatrix}$ $D(8|0|0)$



3. $f(x)=3^x$; $g(x)=e^{1-x}$ $\quad x_s = 1/(1+\ln 3)$

$A=\int_0^{1/(1+\ln3)}(g-f)\,dx=\left[-e^{1-x}-\frac{1}{\ln3}3^x\right]_0^{x_s}$

$3^x=e^{1-x} \quad |\ln$

$x\cdot\ln3=1-x$

$x\cdot\ln3+x=1$

$\underline{x=\frac{1}{1+\ln3}}$

$=-e^{1-x_s}-\frac{3^{x_s}}{\ln3}-(-e-\frac{1}{\ln3})$

$1-\frac{1}{1+\ln3}=\frac{\ln3}{1+\ln3}$

bei x_s ist $e^{1-x_s}=3^{x_s}$

$=-(1+\frac{1}{\ln3})e^{1-x_s}+e+\frac{1}{\ln3}$

$e^{\frac{\ln3}{1+\ln3}}=$

$\underline{A=e+\frac{1}{\ln3}-(1+\frac{1}{\ln3})e^{\frac{\ln3}{1+\ln3}}\approx 0{,}404}$

Mater GF
H21

4. $\cos x - 2\cos^2 x = 0$ $\qquad \mathbb{D} = [0; 3\pi)$

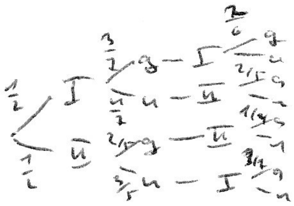
$\underbrace{\cos x}_{=0}(\underbrace{1 - 2\cos x}_{=0}) = 0$

$x_1 = \frac{\pi}{2}$ | $x_3 = \pi/3$

$x_2 = \frac{3}{2}\pi$ | $x_4 = \frac{5\pi}{3}$

$\mathbb{L} = \{ \frac{\pi}{3}; \frac{\pi}{2}; \frac{3}{2}\pi; \frac{5\pi}{3}; \frac{7}{3}\pi; \frac{5}{2}\pi \}$

5. I $1 \ldots 7$
II $1 \ldots 5$



a) $P(gg) = \frac{3}{7} \cdot \frac{2}{6} + \frac{2}{5} \cdot \frac{1}{4} = \frac{17}{70}$

b) $P(\overset{I}{}(gg) / P(gg)) = \frac{3/7 \cdot 2/6}{17/70} = \frac{10}{17}$

c) 4 Punkte : $\overset{I\ II}{(2;2)}$; $(1;4)$; $(4;1)$ $= \frac{1}{7} \cdot \frac{1}{5} + \frac{3}{7} \cdot \frac{1}{5} + \frac{1}{7} \cdot \frac{3}{5} = \frac{1}{5}$

d) > 4 " $= 1 - P(\text{keine } 4P) = 1 - (\frac{1}{7} \cdot \frac{1}{5} + \frac{2}{7} \cdot \frac{1}{5} + \frac{1}{7} \cdot \frac{2}{5}) = \frac{30}{35} = \frac{6}{7}$

$(1;1)$
$(1;3)$; $(3;1)$

e) $P((x;y)|6) / P(6)$ $\quad P(6)$: $(3;3)$; $(6;1)$ $= \frac{1}{7} \cdot \frac{1}{5} + \frac{1}{7} = \frac{6}{35}$

$= \frac{1/7}{6/35} = \frac{1}{30}$

f) $P(4P \cup 2 \text{gleich}) = \frac{1}{5} + 5 \cdot \frac{1}{7} \cdot \frac{1}{5} - (\frac{1}{7} \cdot \frac{1}{5}) = \frac{11}{35}$

$(2;2)$

$1;1$
$2;2$
$3;3$
$4;4$
$5;5$

g) $P(\text{mind. einmal } 4P \text{ in } n \text{ V.}) > 99{,}9\%$

$1 - P(\text{nie } 4P) > 0{,}999$

$(\frac{4}{5})^n < 0{,}001$

$n > 30{,}96$ $\qquad$ Ab 31 Versuchen

6. "O" $= 24 = G + 3A_\Delta = \frac{a^2}{4}\sqrt{3} + 3 \cdot \frac{1}{2} a \cdot h \rightarrow h = \frac{24 - \frac{\sqrt{3}}{4}a^2}{\frac{3}{2}a}$ $\qquad \mathbb{D} = [0; \sqrt{\frac{96}{\sqrt{3}}}]$

$G = \frac{a^2}{4}\sqrt{3}$

$V = \frac{1}{3} G \cdot h = \frac{1}{3} \cdot \frac{a^2}{4}\sqrt{3} \cdot \frac{24 - \frac{\sqrt{3}}{4}a^2}{\frac{3}{2}a} = \frac{\sqrt{3}}{18}(24 - \frac{\sqrt{3}}{4}a^2)a = \frac{\sqrt{3}}{36}(24a - \frac{\sqrt{3}}{4}a^3)$

$V' = \frac{\sqrt{3}}{36}(24 - \frac{3}{4}\sqrt{3}a^2)$ $\qquad V'' = -\frac{2}{2}\sqrt{3}a < 0$ für $a > 0 \Rightarrow$ Max

$V' = 0$: $a = \pm\sqrt{\frac{96}{3\sqrt{3}}}$ $\in \mathbb{D}$ $\qquad (+) \rightarrow V'' < 0$: Max

Ränder: $V(0) = 0$, $V(\sqrt{\frac{96}{\sqrt{3}}}) = 0$ } Min $\qquad \underline{a = \sqrt{\frac{96}{3\sqrt{3}}}} \approx 4{,}3$ $\qquad \frac{\sqrt{3}}{4}a^2 = 8$

$\underline{h} = \frac{16}{3a} = \underline{\frac{2}{3}\sqrt{2\sqrt{3}}} = 1{,}24$