1. a) $f = g$

$2x^3 - 15x^2 + 27x - 10 = 0$

$L \; \pm 1; \pm 2; \pm 5; \pm 10$

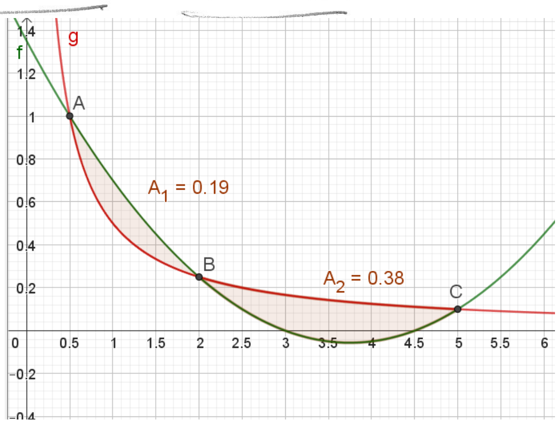
$\underline{x = 2}$

$(\;\text{"}\;) : (x-2) = 2x^2 - 11x + 5$

$\underline{x = \frac{1}{2}} ; \underline{x = 5}$

$\underline{S_1(2|\tfrac{1}{4})}$

$\underline{S_2(\tfrac{1}{2}|1)} ; \underline{S_3(5|\tfrac{1}{10})}$



b) $f'(x) = \frac{1}{5}x - \frac{3}{4}$; $g'(x) = -\frac{1}{2}\frac{1}{x^2}$

c) $f'(x) = g'(-1)$

$\frac{1}{5}x - \frac{3}{4} = -\frac{1}{2}$

$\underline{x = 5/4}$

d) g ist eine Hyperbel, gestaucht in y-Richtung um 2, also kein WP

f ist eine Parabel, also kein WP

e) $x = 0$; einfacher Pol, Vorzeichenwechsel ('−' → '+')

f) $\int f(x)\,dx = \frac{1}{30}x^3 - \frac{3}{8}x^2 + \frac{27}{10}x + C$

$(\ln x)' = \frac{1}{x}$ weil $(e^{\ln x})' = (x)'$

$e^{\ln x}(\ln x)' = 1$

$\ln x' = \frac{1}{e^{\ln x}} = \frac{1}{x}$

also ist $\ln x + C$ Stammfunktion von $\frac{1}{x}$, also $\frac{1}{2}\ln x + C$ Stammfkt. $\frac{1}{2}\frac{1}{x}$

g) $\int_1^2 g(x)\,dx = [\tfrac{1}{2}\ln x]_1^2 = \frac{1}{2}\ln 2 - \frac{1}{2}\underbrace{\ln 1}_{0} = \underline{\frac{1}{2}\ln 2}$

h) $A = \int_{1/2}^{2}(f-g)\,dx + \int_{2}^{5}\underbrace{(g-f)}_{=-(f-g)}dx = \left[\frac{1}{30}x^3 - \frac{3}{8}x^2 + \frac{27}{10}x - \frac{1}{2}\ln x\right]_{1/2}^{2} - [\,\text{"}\,]_2^5 = \underbrace{\frac{-160\ln 2 + 141}{160}}_{0,19} + \underbrace{\frac{-20\ln 2 + 20\ln 5 - 3}{40}}_{0,38} = \frac{-3}{2}\ln 2 + \frac{1}{2}\ln 5 + \frac{129}{160} = 0,57$

2. $p(18) = 85\%$ $p(54) = 75\%$; $p(81) = 67{,}5\%$; $p(t) = 90\% - 25\% \cdot \frac{t}{90}$

a) $\underline{67{,}5\%}$

b) $p(\text{kein}) = \bar{p}_{18}\,\bar{p}_{54}\,\bar{p}_{81} = 0{,}15 \cdot 0{,}25 \cdot 0{,}325 = \underline{1{,}22\%}$

c) $p(\text{einer}) = p_{18} \cdot \bar{p}_{54}\,\bar{p}_{81} + \bar{p}_{18}\,p_{54}\,\bar{p}_{81} + \bar{p}_{18}\,\bar{p}_{54}\,p_{81} =$

$= 0{,}85 \cdot 0{,}25 \cdot 0{,}325 + 0{,}15 \cdot 0{,}75 \cdot 0{,}325 + 0{,}15 \cdot 0{,}25 \cdot 0{,}675 = \underline{13{,}1\%}$

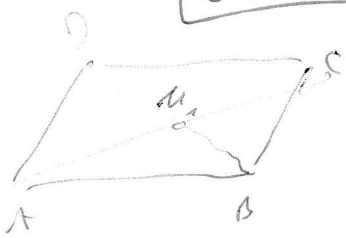
d) $p(3\text{ v. }5, p = 0{,}9) = \binom{5}{3} \cdot 0{,}9^3 \cdot 0{,}1^2 = 7{,}29\%$

e) $\underline{p_{18} = 88\%}$ $\underline{p_{54} = 76{,}6\%}$ $p_{81} = 58{,}9\%$ Beim ersten und zweiten

3. a) $\vec{AB} = \begin{pmatrix}4\\4\\-3\end{pmatrix}$

$\vec{AM_1} = \begin{pmatrix}0\\3\\4\end{pmatrix}$ $\quad \vec{C} = \vec{A} + 2\vec{AM_1} = \begin{pmatrix}2\\3\\10\end{pmatrix}$ $\quad C(2|3|10)$

$\vec{D} = \vec{C} - \vec{AB} = \begin{pmatrix}-2\\-1\\13\end{pmatrix}$ $\quad D(-2|-1|13)$



b) $\cos(\sphericalangle ABC) = \frac{\vec{BA}\cdot\vec{BC}}{BA\cdot BC} = \frac{\begin{pmatrix}-4\\-4\\3\end{pmatrix}\cdot\begin{pmatrix}-4\\2\\11\end{pmatrix}}{\sqrt{4^2+4^2+3^2}\cdot\sqrt{4^2+2^2+11^2}} = \frac{41}{\sqrt{41}\sqrt{141}} = 0,5392$

$\sphericalangle ABC = 57,4° = \beta$

c) $A = AB\cdot BC\cdot \sin\sphericalangle(ABC) = 64,03$

d) $E_1:\ \vec{x} = \begin{pmatrix}2\\-3\\2\end{pmatrix} + t\begin{pmatrix}4\\4\\-6\end{pmatrix} + s\begin{pmatrix}0\\3\\4\end{pmatrix}$

e) $\vec{AB} = \begin{pmatrix}4\\4\\-3\end{pmatrix}$ $\quad \overrightarrow{AB}\cdot\overrightarrow{AM_1} = 0$, also 90°

$\vec{AM_1} = \begin{pmatrix}0\\3\\4\end{pmatrix}$ $\quad$ Also ist Abstand M_1 zu Gerade AB gleich der Länge $AM_1=5$

f) $\vec{n_1} = \vec{AB} \times \vec{AM_1}$

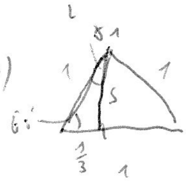
g) $M_2(x|0|0)$ Rhombus: $\vec{AM_2}\cdot\vec{BM_2} = 0$

$\begin{pmatrix}x-2\\3\\-2\end{pmatrix}\begin{pmatrix}x-6\\-1\\1\end{pmatrix} = 0$

$(x-2)(x-6)-3-2 = 0$

$x_1 = 1 \quad x_2 = 7$

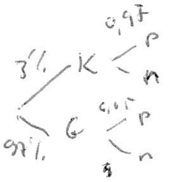
4a) $\int_2^1 e^{-\frac{1}{2}x-1}\,dx = \left[-2e^{-\frac{1}{2}x-1}\right]_2^1 = -\frac{2}{e^2}(\sqrt{e}-1)$

b) 

$s^2 = 1^2 + (\frac{1}{3})^2 - 2\cdot 1\cdot \frac{1}{3}\cos 60°$ $\quad \sin\gamma_1 = \frac{1}{3}\frac{\sin 60°}{s} = 0,327$

$s = \sqrt{\frac{7}{9}} = 0,882$ $\quad \gamma_1 = 19,1°$

$\gamma_2 = 40,9°$

c) 

$P(K|p) = \frac{K_p}{K_p+G_p} = \frac{0,03\cdot 0,97}{0,03\cdot 0,97 + 0,97\cdot 0,05} = 37,5\%$

d) $y_1 = \cos(2x)+c$ $\quad y_2 = \sin(2x)$ $\quad y_1' = y_2'$ $\quad c = \sin(2x_1) - \cos(2x_1)$

$y_1' = -2\sin(2x)$ $\quad y_2' = 2\cos(2x)$ $\quad \tan 2x = -1$ $\quad c = \sqrt{2}$

$x = -22,5° + 90°\cdot k$

$x = 67,5°$

e) $\tilde{x}_{med} = \frac{6,8+7,3}{2} = 7,05$

$\bar{x}_{arit} = 7$ $\quad \sigma = 0,503$