

1.  $p(1) = 0,4 \quad p(2) = 0,6$

a) i)  $P(3 \times '2') = 0,6^3 = 21,6\%$

ii)  $P(\text{mind. einmal } 1) = 1 - P(\text{kein } 1) = 1 - 0,6^3 = 78,4\%$

b)  $\bar{x} = \frac{5 \cdot 1 + 3 \cdot 2 + 1 \cdot 3}{100} = 1,65$

$\text{Var} = [5 \cdot 2 \cdot (1 - \bar{x})^2 + 3 \cdot (2 - \bar{x})^2 + 1 \cdot (3 - \bar{x})^2] \cdot \frac{1}{100} = 0,5675$

c)  $G_2 \quad p(2) = \dots \quad p(3) = \frac{1}{2} p(1)$   
 $p(1) + 1,5 \cdot p(1) + \frac{1}{2} p(1) = 1$   
 $p(1) = \frac{1}{3} \quad p(2) = \frac{1}{2} \quad p(3) = \frac{1}{6}$

oder  
 $p(2) = p(1) + 0,5$   
 $p(3) = \frac{1}{2} p(1)$   
 $p(1) + p(2) + p(3) = 1$   
 $p(1) + p(1) + 0,5 + \frac{1}{2} p(1) = 1$   
 $p(1) = \frac{1}{3} = 33,3\%$   
 $p(2) = 70\%$   
 $p(3) = 10\%$

d)  $p(1) = 0,1 \quad p(2) = 0,4 \quad p(3) = 0,5$

i)  $4 = 1 + 3 = 3 + 1 = 2 + 2$   
 $= 0,4 \cdot 0,5 + 0,6 \cdot 0,04 = 44\%$

ii)  $1 \cdot 2; 2 \cdot 1; 2 \cdot 2; 2 \cdot 3$   
 $0,4 \cdot 0,4 + 0,6 \cdot 0,1 + 0,6 \cdot 0,4 + 0,6 \cdot 0,1$   
 $= 0,4 \cdot 0,4 + 0,6 = 76\%$

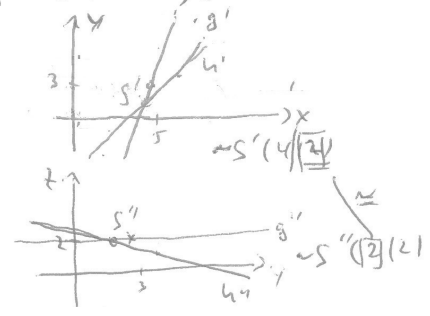
2. a)  $\vec{x} = \begin{pmatrix} 0 \\ 4 \\ 1 \end{pmatrix} + s \begin{pmatrix} -4 \\ -8 \\ 3 \end{pmatrix}$

$x = 0 : t = -5 \quad (0 | -22 | 2)$

b) Schnitt im Raum  $\rightarrow$  auch 'Schatten' (Projektion auf Koord-Ebenen) schneiden sich in gemeinsamen Koordinaten

$g: \begin{pmatrix} 5 \\ 3 \\ 2 \end{pmatrix} + t \begin{pmatrix} 1 \\ 5 \\ 0 \end{pmatrix} \rightarrow \begin{matrix} x: (5) + t(1) \quad g' \\ y: (3) + t(5) \quad g'' \end{matrix}$   
 $h: \begin{pmatrix} 6 \\ 4 \\ 1 \end{pmatrix} + s \begin{pmatrix} -4 \\ -8 \\ 3 \end{pmatrix} \rightarrow \begin{matrix} x: (6) + s(-4) \quad h' \\ y: (4) + s(-8) \quad h'' \end{matrix}$

gleiches y-Ko:  $\rightarrow$  Schnitt im Raum

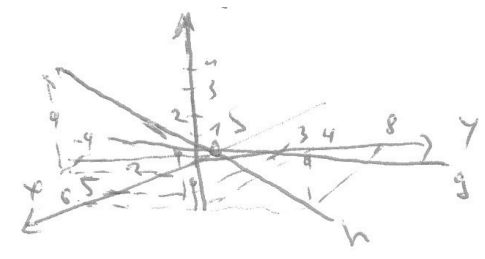


c)  $g = h$   
 $s = \frac{1}{3}$   
 $t = -\frac{1}{3}$

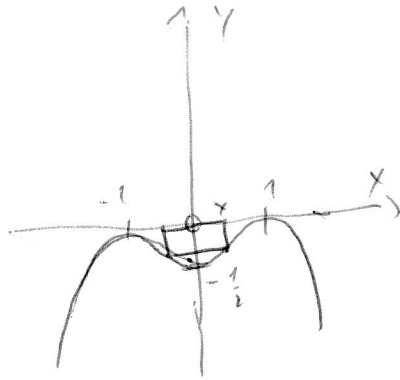
$S \left( \frac{14}{3} \mid \frac{4}{3} \mid 2 \right)$

$\cos \alpha = \frac{\begin{pmatrix} -4 \\ -8 \\ 3 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 5 \\ 0 \end{pmatrix}}{\sqrt{85} \sqrt{26}} = \frac{-4 - 40}{\sqrt{85} \sqrt{26}}$

$\alpha = 156,2^\circ$



3. a)  $f(x) = a(x+1)^2(x-1)^2 = a(x^4 - 2x^2 + 1)$   
 $f(0) = -\frac{1}{2} = a$   
 $f(x) = -\frac{1}{2}(x^4 - 2x^2 + 1)$



b)  $A = 2x |f(x)| = -2x \cdot f(x)$   
 $x \in [0; 1]$

$A(x) = x^5 - 2x^3 + x$   
 $A'(x) = 5x^4 - 6x^2 + 1 = 0$   
 $x = \pm 1$   
 $x = \pm \frac{1}{5}\sqrt{5}$

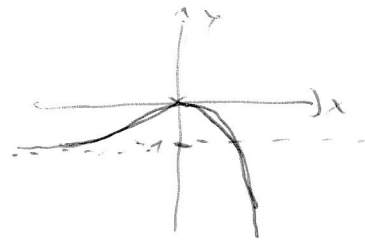
$A''(x) = 20x^3 - 12x$   
 $A'(1) > 0 \Rightarrow \text{Min}$   
 $A'(\frac{1}{5}\sqrt{5}) < 0 \Rightarrow \text{Max}$

$A(0) = 0$   
 $A(1) = 0$   
 $x = \frac{1}{5}\sqrt{5}$

$A(\frac{1}{5}\sqrt{5}) = \frac{16}{125}\sqrt{5}$

4.  $f(x) = (e^x - 1)(1 - e^x) = -(e^x - 1)^2 \leq 0$   
 $\underbrace{= 0}_{x=0}$   
 a)  $f'(x) = -2(e^x - 1) \cdot e^x = 0$   
 $\underbrace{= 0}_{x=0}$   $f(0) = 0$

Max (0|0)  $\mathbb{W} = \mathbb{R}_0^-$



$\lim_{x \rightarrow +\infty} f(x) = -\infty$   
 $\lim_{x \rightarrow -\infty} f(x) = -1$

b)  $f(\ln 2) = -1$   $f'(\ln 2) = -4$   $t: y = -4(x - \ln 2) - 1$

5.1.  $\cos x - 2 \cos^2 x = 0$   
 $\cos x (1 - 2 \cos x) = 0$   
 $\frac{\pi}{2}; \frac{3\pi}{2}$   $\frac{\pi}{3}; \frac{5\pi}{3}$

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

5.2.  $f(x) = 3kx - x - kx^2$

$3kx - x - kx^2 = 3gx - x - gx^2$   
 $(g-k)x^2 + 3(k-g)x = 0$   $x=0$   $y=0$  (0|0)  
 $x((g-k)x + 3(k-g)) = 0$   
 $x(x-3)(g-k) = 0$   $x=3$   $y=-3$  (3|-3)

5.3.  $WA = \frac{300}{23} = 600$   
 $WB = \frac{400}{5.74} = 711,32$

$WA' = WA \cos 30 = 519,6$   
 $WB' = WB \cos 34 = 593$   
 $AB' = \sqrt{WA'^2 + WB'^2 - 2WA'WB' \cos 166}$   
 $= 964,2$

$AB = \sqrt{AB'^2 + 100^2} = 969,4$   
 $\tan \delta = \frac{100}{AB'}$   
 $\delta = 5,9^\circ$