Pass H20

1. a) $\vec{x} = \begin{pmatrix} 2 \\ 3 \\ 4 \end{pmatrix} + s\underbrace{\begin{pmatrix} 4 \\ -1 \\ -4 \end{pmatrix}}_{\vec{AB}} + t\underbrace{\begin{pmatrix} 2 \\ 2 \\ -8 \end{pmatrix}}_{\vec{AC}}$

b) $AB = 6$; $AC = \sqrt{72}$; $\vec{BC} = \begin{pmatrix} -2 \\ 4 \\ -4 \end{pmatrix}$ $BC = 6$

gleichschenklig ; $6^2 + 6^2 = 72$; also $\triangle$ bei B

d) $\vec{r}_D = \vec{r}_C - \vec{AB} = \begin{pmatrix} 0 \\ 7 \\ 0 \end{pmatrix}$ $D(0|7|0)$

2. $f_a(x) = a \cdot x \cdot (x-5)^2 = a(x^3 - 10x^2 + 25x)$; $f_a'(x) = a(3x^2 - 20x + 25)$; $f_a''(x) = a(6x - 20)$

a) $f'(3) = -\frac{1}{2}$

$a \cdot (3 \cdot 3^2 - 20 \cdot 3 + 25) = -\frac{1}{2} \rightarrow a = \frac{1}{16}$

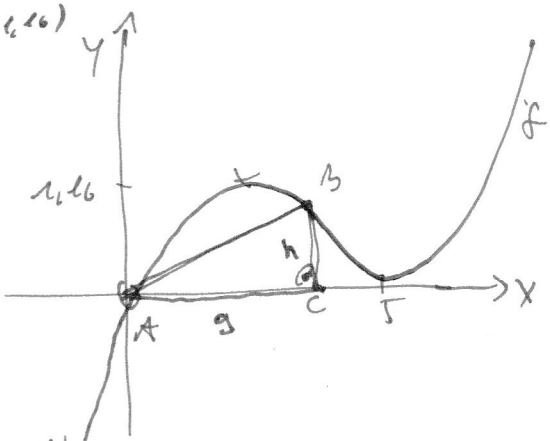
$f(x) = \frac{1}{16} x(x-5)^2$ $f'(x) = \frac{1}{16}(3x^2 - 10x + 25)$; $f''(x) = \frac{1}{16}(6x - 20)$

NST : $x = 0$ $x = 5$

$f' = 0$
$x = 5$ $y = 0$
$x = 5/3$ $y = 1{,}16$

$f''(5) > 0 \Rightarrow$ Min $(5|0)$
$f''(\frac{5}{3}) < 0 \Rightarrow$ Max $(\frac{5}{3}|1{,}16)$

$f'' = 0$
$x = 10/3$ $y = 0{,}58$
einfach, LK $\neq$ W, WP $(\frac{10}{3}|0{,}58)$



b) $a \cdot \underbrace{x}_{0} \cdot \underbrace{(x-5)^2}_{5} = 0$
NST

$A = \int_0^5 f_a(x)\,dx = a\left[\frac{1}{4}x^4 - \frac{10}{3}x^3 + \frac{25}{2}x^2\right]_0^5$

$= a \cdot \frac{625}{12}$

c) $A_{ABC} = \frac{1}{2} gh = \frac{1}{2} x \cdot f_a(x) = \frac{1}{2} a \cdot (x^4 - 10x^3 + 25x^2)$ $\rightarrow$ max

$D = [0;5]$

$A' = \frac{1}{2} a(4x^3 - 30x^2 + 50x) = 0$

$x = 0$; $x = \frac{5}{2}$; $x = 5$

$A''(x) = \frac{1}{2} a(12x^2 - 60x + 50)$

$A''(\frac{5}{2}) < 0 \Rightarrow$ Max
$A(0) = 0$ } Min
$A(5) = 0$ }

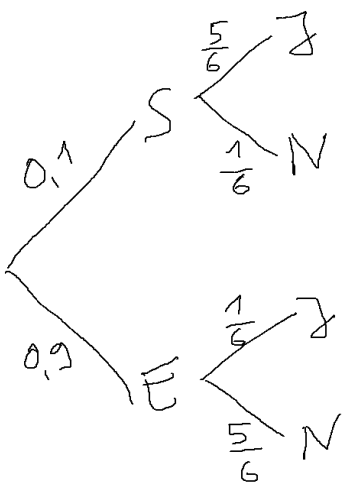
Max $x = \frac{5}{2}$

$B(\frac{5}{2} | \frac{125}{8} a)$

Passbtl20

3. 1–4: ehrlich ; 5: Ja ; 6: Nein $p = 0{,}1$

a)



$P(A: \text{Ja}) = 0{,}1 \cdot \frac{5}{6} + 0{,}9 \cdot \frac{1}{6} = \frac{7}{30} = 23{,}3\,\%$

$P(B: \text{Ja} \mid \text{Schummelt}) = \frac{0{,}1 \cdot \frac{5}{6}}{0{,}1 \cdot \frac{5}{6} + 0{,}9 \cdot \frac{1}{6}} = \frac{5}{14} = 35{,}7\,\%$

$P(C: \text{mind. 1 von 10 Ja}) = 1 - P(\text{keiner Ja})$
$= 1 - \left(\frac{23}{30}\right)^{10} = 93\,\%$

b)

$P(\text{Ja}) = p \cdot \frac{5}{6} + (1-p) \cdot \frac{1}{6} = \frac{1}{6} + \frac{4}{6}p$

c) $P(\text{Ja}) = 22{,}2\,\% = \frac{1}{6} + \frac{4}{6}p \Rightarrow p = 9{,}2\,\%$

4.1 a) $\begin{pmatrix} -2 \\ 1 \end{pmatrix} = c \cdot \begin{pmatrix} 3 \\ 2k \end{pmatrix} \Rightarrow \begin{matrix} -2 = 3c \Rightarrow c = -\frac{2}{3} \\ 1 = 2c \cdot k \end{matrix}$ $k = \frac{1}{2c} = -\frac{3}{4}$

b) $\begin{pmatrix} 1 \\ u \\ u-1 \end{pmatrix} \cdot \begin{pmatrix} 4 \\ -5 \\ 2u \end{pmatrix} = 0 \Rightarrow 4 - 5u + (u-1)(2u) = 0$

$u_1 = \frac{1}{2}$; $u_1 = 4$

4.2. $\frac{1}{4}x = -\sqrt{5 - x^2}$

$\frac{1}{16}x^2 = 5 - x^2$

$x^2 = 4$

$x = \pm 2$ Probe: $x = +2$ ✓

$x = -2$

4.3. $f(x) = x^4 e^{2x}$

$f'(x) = 4x^3 e^{2x} + x^4 \cdot e^{2x} \cdot 2 = 0$

$2x^3 (2 + x) e^{2x} = 0$

$x = 0$ $x = -2$ $\neq 0$