

Übungsserie Mathematik Teil B

1. a) $U = 20 + \frac{2 \cdot 20 \cdot \pi}{4} = \underline{\underline{51,416}}$

b) $A_{III} = \frac{20^2 \cdot \pi}{4} - \frac{20^2 \cdot \pi}{3} + 100 \cdot \sqrt[3]{1} = \underline{\underline{68,485}}$

2. a) $134 = 125 \cdot b^2 \Rightarrow b = \sqrt{\frac{134}{125}} = 1,035374$ 1/2 P
 Zuwachsrate $r = \underline{\underline{3,54\%}}$ 1/2 P

b) $125 \cdot 10^6 \cdot 1,035374^u = 160 \cdot 10^6 \cdot 1,021^u$ 1/2 P
 $\left(\frac{1,035374}{1,021}\right)^u = \frac{160}{125} \Rightarrow u = \frac{\lg(160/125)}{\lg(1,035374/1,021)}$ 2

Nach $u = 17,657467$ Jahren 1/2 P

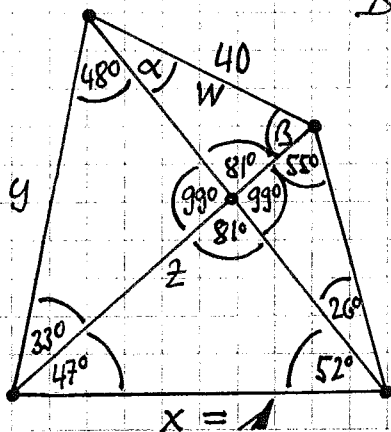
c) $160 \cdot 10^6 = N_{90} \cdot 1,021^{11}$ 2
 $N_{90} = \frac{160 \cdot 10^6}{1,021^{11}} = 127,3025 \cdot 10^6$ 1/2 P

$127,3025 \cdot 10^6 = 120 \cdot 10^6 \cdot 1,019^u$ 2 1/2 P

$u = \frac{\lg(127,3025/120)}{\lg(1,019)} = 3,1386$ Jahre 2 1/2 P

13,1386 Jahre vor Anfang 2001 1/2 P

3.



Beachte: Annahme: $x = 1$

$y = \frac{\sin 52^\circ}{\sin 48^\circ} = 1,0604$

$z = \frac{\sin 78^\circ}{\sin 55^\circ} = 1,1941$

$w = \sqrt{y^2 + z^2 - 2yz \cos 33^\circ}$ 2

$w = 0,6530$ 2

$x = 6,12543$

4. siehe Zeichnung Aufgabenblatt! ↷

a.) Durchmesser $d = 2m + x = 120$; $m \hat{=} \text{Höhe } \Delta$.

$$\hookrightarrow \underline{m = 60 - \frac{x}{2}}$$

Pyramide: $h^2 + \frac{x^2}{4} = m^2$ ↷

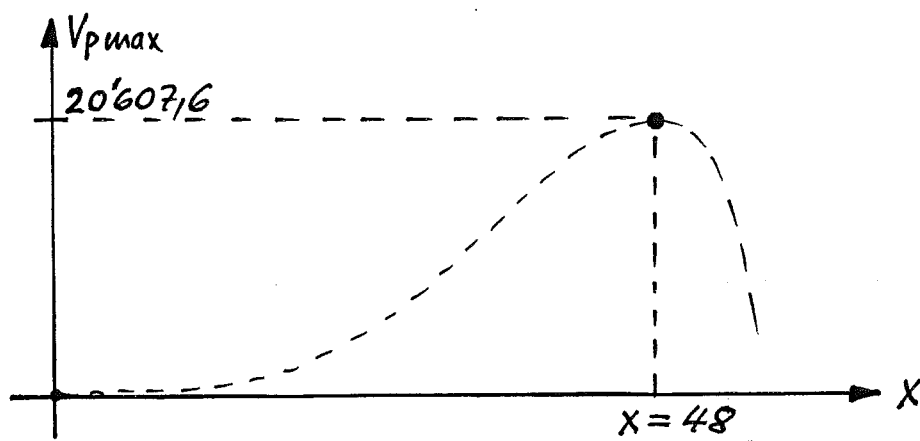
$$h^2 = m^2 - \frac{x^2}{4} \Rightarrow h = \sqrt{m^2 - \frac{x^2}{4}}$$

$$h = \sqrt{\left(60 - \frac{x}{2}\right)^2 - \frac{x^2}{4}} = \sqrt{3600 - 60x}$$

$$V_P = \frac{x^2 \cdot h}{3} = \frac{x^2 \sqrt{3600 - 60x}}{3}$$

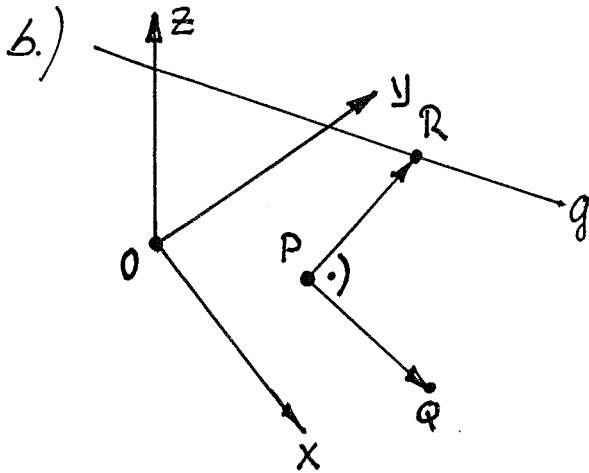
$V_{Pmax} \rightarrow \text{T/N} \rightarrow V_P$ ist maximal für $x = 48$

b.) $V_{Pmax} = \frac{48^2 \sqrt{3600 - 60 \cdot 48}}{3} = 20'607,6025$



5. Geg: $A(2|-1|1)$; $B(3|1|0)$;
 $P(-1|3|-2)$; $Q(1|3|2)$.

a.) $\underline{\underline{g: \vec{x} = \begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix} + t \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix}}}$



$$\cos 90^\circ = \frac{\vec{PQ} \cdot \vec{PR}}{|\vec{PQ}| \cdot |\vec{PR}|} = 0$$

$$\hookrightarrow \vec{PQ} \cdot \vec{PR} = 0$$

$$\vec{PQ} = \begin{pmatrix} 1 - (-1) \\ 3 - 3 \\ 2 - (-2) \end{pmatrix} = \begin{pmatrix} 2 \\ 0 \\ 4 \end{pmatrix}$$

$$\vec{PR} = \begin{pmatrix} 2+t+1 \\ -1+2t-3 \\ 1-t+2 \end{pmatrix} = \begin{pmatrix} t+3 \\ 2t-4 \\ -t+3 \end{pmatrix}$$

$$\begin{aligned} \vec{PQ} \cdot \vec{PR} &= 2(t+3) + 0(2t-4) + 4(-t+3) = 0 \\ &= 2t+6 - 4t+12 = 0 \Rightarrow \underline{\underline{t=9}} \end{aligned}$$

$$\vec{OR} = \vec{OP} + \vec{PR}$$

$$\vec{OR} = \begin{pmatrix} -1 \\ 3 \\ -2 \end{pmatrix} + \begin{pmatrix} 9+3 \\ 18-4 \\ -9+3 \end{pmatrix} = \begin{pmatrix} 11 \\ 17 \\ -8 \end{pmatrix} \Rightarrow \underline{\underline{R(11|17|-8)}}$$

6.

a) $y = ax^4 + bx^2 + c$ Punkte einsetzen \rightarrow

$$\begin{cases} c=1 \\ a+b+c=-0.75 \\ 81a+9b+c=3.25 \end{cases} \rightarrow \underline{\underline{y = 0.25x^4 - 2x^2 + 1}}$$

b) Min. bestimmen $(-2|-3), (2|-3)$

$$\rightarrow \underline{\underline{W = [-3; \infty[}}$$

c) Koordinatentransformation

$$\rightarrow y = 0.25(x-6)^4 - 2(x-6)^2 + 1 + 6$$

$$\underline{\underline{y = 0.25x^4 - 6x^3 + 52x^2 - 192x + 259}}$$

d) S grafisch bestimmen $\underline{\underline{S = (3.198 / 6.703)}}$