

# Lösungen K 12

① K12

## Aufgabe 1 a)

① NB:  $A = 2x \cdot y$

② NB:  $f(x) = -0,3x^2 + 8,1$

③  $f(x) = 0$

$$0 = -0,3x^2 + 8,1$$

$$0,3x^2 = 8,1 \quad | :0,3$$

$$x^2 = 27 \quad | \sqrt{\quad}$$

$$x_1 = 5,2$$

$$x_2 = -5,2$$

$$\mathbb{D} = [0; 5,2]$$

④  $A(x) = 2x \cdot (-0,3x^2 + 8,1)$

$A(x) = -0,6x^3 + 16,2x$  Zf.

⑤  $A'(x) = -1,8x^2 + 16,2$

$$A''(x) = -3,6x$$

$$A'(x) = 0 \text{ und } A''(x) \neq 0$$

$$0 = -1,8x^2 + 16,2$$

$$1,8x^2 = 16,2 \quad | : (1,8)$$

$$x^2 = 9 \quad | \sqrt{\quad}$$

$$x_1 = 3 \text{ LE}$$

$$x_2 = -3$$

$$A''(3) = -10,8$$

$< 0 \Rightarrow \text{Max}$

⑥  $f(3) = 5,4 \text{ LE}$

⑦  $A = 2 \cdot 3 \cdot 5,4$

$A = 32,4 \text{ FE}$

Die Seitenlängen betragen 6 LE und 5,4 LE.

⑧  $A(0) = 0 < 32,4$

$$A(5,2) = -0,1 < 32,4$$

b)

① NB:  $u = 4x + 2y$

② NB:  $f(x) = -0,3x^2 + 8,1$

③ s.o.  $\mathbb{D} = [0; 5,2]$

④  $u(x) = 4x + 2 \cdot (-0,3x^2 + 8,1)$

$$u(x) = 4x - 0,6x^2 + 16,2$$

$$\underline{u(x) = -0,6x^2 + 4x + 16,2 \quad \text{ZF}}$$

② kir

⑤  $u'(x) = -1,2x + 4$

$$u''(x) = -1,2$$

$$u'(x) = 0 \text{ und } u''(x) \neq 0$$

$$0 = -1,2x + 4$$

$$1,2x = 4 \quad | : 1,2$$

$$x = 3,3$$

$$u''(3,3) = -1,2 < 0 \\ \Rightarrow \text{Max.}$$

⑥

$$\underline{f(3,3) = 4,8 \text{ LE}}$$

⑦

$$u = 4 \cdot 3,3 + 2 \cdot 4,8$$

$$\underline{u = 22,8 \text{ LE}}$$

⑧  $u(0) = 16,2 < 22,8$

$$u(5,2) = 20,8 < 22,8$$

## Aufgabe 2

① NB:  $A = x \cdot y$

② NB:  $f(x) = 1,5x^3 - 9x^2 + 48$

③  $f(x) = 0$

$$0 = 1,5x^3 - 9x^2 + 48 \quad | : 1,5$$

$$0 = x^3 - 6x^2 + 32 \quad [x_1 = -2]$$

$$(x^3 - 6x^2 + 0x + 32) : (x + 2) = x^2 - 8x + 16$$

$$\underline{-(x^3 + 2x^2)}$$

$$-8x^2 + 0x$$

$$\underline{-(-8x^2 - 16x)}$$

$$+16x + 32$$

$$\underline{-(+16x + 32)}$$

0

$$x^2 - 8x + 16 = 0$$

$$x_{2/3} = 4 \pm \sqrt{16 - 16}$$

$$x_{2/3} = 4$$

$$\mathbb{D} = [0; 4]$$

$$\textcircled{4} \quad A(x) = x \cdot (1,5x^3 - 9x^2 + 48)$$

$$\underline{A(x) = 1,5x^4 - 9x^3 + 48x \quad \text{Zf.}}$$

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$$\textcircled{5} \quad A'(x) = 6x^3 - 27x^2 + 48$$

$$A'(x) = 0 \text{ und } A''(x) \neq 0$$

$$A''(x) = 18x^2 - 54x$$

$$0 = 6x^3 - 27x^2 + 48 \quad | :6$$

$$0 = x^3 - 4,5x^2 + 8 \quad x_1 = 4$$

$$\begin{array}{r} (x^3 - 4,5x^2 + 0x + 8) : (x - 4) = x^2 - 0,5x - 2 \\ -(x^3 - 4x^2) \end{array}$$

$$\begin{array}{r} \hline -0,5x^2 + 0x \\ -(-0,5x^2 + 2x) \\ \hline -2x + 8 \\ -(-2x + 8) \\ \hline 0 \end{array}$$

$$x^2 - 0,5x - 2 = 0$$

$$x_{2/3} = +0,25 \pm \sqrt{0,25^2 + 2}$$

$$x_2 = 1,7 \text{ LE}$$

$$\boxed{x_3 = -1,2}$$

$$A''(4) = 72 > 0 \Rightarrow \text{Min}$$

$$A''(1,7) = -39,8 < 0 \Rightarrow \text{Max}$$

$$\textcircled{6} \quad \underline{f(1,7) = 29,4 \text{ LE}}$$

$$\textcircled{7} \quad \begin{array}{l} A = 1,7 \cdot 29,4 \\ \underline{A = 50 \text{ FE}} \end{array}$$

$$\textcircled{8} \quad \begin{array}{l} A(0) = 0 < 50 \\ A(4) = 0 < 50 \end{array}$$

### Aufgabe 3

$$\textcircled{1} \quad \text{NB: } V = a^2 \cdot h$$

$$\textcircled{2} \quad \text{NB: } 90 = 8a + 4h$$

$$\textcircled{3} \quad 90 - 8a = 4h \quad | :4$$

$$22,5 - 2a = h$$

$$h = 0$$

$$22,5 - 2a = 0$$

$$22,5 = 2a$$

$$11,25 = a$$

$$\mathbb{D} = [0; 11,25]$$

$$\textcircled{4} \quad V(a) = a^2 \cdot (22,5 - 2a)$$

$$V(a) = 22,5a^2 - 2a^3$$

$$\underline{V(a) = -2a^3 + 22,5a^2 \quad \text{Zf.}}$$

$$\textcircled{5} \quad V'(a) = -6a^2 + 45a$$

$$V''(a) = -12a + 45$$

$$V''(0) = 45 > 0 \Rightarrow \text{Min}$$

$$V''(7,5) = -45 < 0 \Rightarrow \text{Max}$$

$$V'(a) = 0 \text{ und } V''(a) \neq 0$$

$$0 = -6a^2 + 45a \quad | :(-6)$$

$$0 = a^2 - 7,5a$$

$$0 = a(a - 7,5)$$

$$a_1 = 0 \quad a - 7,5 = 0$$

$$\underline{a_2 = 7,5 \text{ cm}}$$

$\textcircled{4}$  K12

$$\textcircled{6} \quad h = 22,5 - 2 \cdot 7,5$$

$$\underline{h = 7,5 \text{ cm}}$$

$$\textcircled{7} \quad V = 7,5^2 \cdot 7,5$$

$$\underline{V = 421,9 \text{ cm}^3}$$

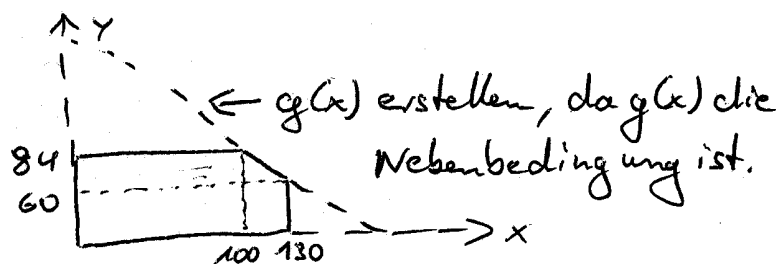
$$\textcircled{8} \quad V(0) = 0 < 421,9$$

$$V(11,25) = 0 < 421,9$$

### Aufgabe 4

a)  $P_1(100|84)$

$P_2(130|60)$



$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{60 - 84}{130 - 100} = \frac{-24}{30} = -\frac{4}{5}$$

$$y = m \cdot x + b \quad m = -\frac{4}{5} \quad P(100|84)$$

$$84 = -\frac{4}{5} \cdot 100 + b$$

$$84 = -80 + b \quad | +80$$

$$164 = b$$

$$\Rightarrow g(x) = -\frac{4}{5}x + 164$$

Das war die Vorarbeit.

$\textcircled{1}$  NB:  $A = x \cdot y$

$\textcircled{2}$  NB:  $g(x) = -\frac{4}{5}x + 164$

$\textcircled{3}$   $g(x) = 0$  wäre falsch! Die Scheibe kann maximal 130 cm breit sein (x-Wert).

$$\Rightarrow \mathbb{D} = [0; 130]$$

$$\textcircled{4} A(x) = x \cdot \left(-\frac{4}{5}x + 164\right)$$

$$A(x) = -\frac{4}{5}x^2 + 164x \quad \text{Zf.}$$

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$$\textcircled{5} A'(x) = -\frac{8}{5}x + 164$$

$$A''(x) = -\frac{8}{5}$$

$$A'(x) = 0 \quad \text{und} \quad A''(x) \neq 0$$

$$0 = -\frac{8}{5}x + 164$$

$$\frac{8}{5}x = 164 \quad | : \frac{8}{5}$$

$$\underline{x = 102,5 \text{ cm}}$$

$$\textcircled{6} \underline{g(102,5) = 82 \text{ cm}}$$

$$\textcircled{7} A = 102,5 \cdot 82$$

$$\underline{A = 8.405 \text{ cm}^2}$$

$$\textcircled{8} A(0) = 0 < 8.405$$

$$A(130) = 7.800 < 8.405$$

b)

$$A_{\text{ganz}} = 130 \cdot 84$$

$$A_{\text{ganz}} = 10.920 \text{ cm}^2 \quad \hat{=} 100\%$$

$$10.920 - 8.405 = 2.515 \text{ cm}^2 \quad \text{Verlust}$$

$$10.920 \hat{=} 100\%$$

$$2.515 \hat{=} x$$

$$x = 23\% \quad \text{Verlust an Glasfläche}$$