

Seite 1

1)

a)  $\sqrt{\frac{4}{9}} = \frac{2}{3}$ ;

b)  $\sqrt{3} \cdot \sqrt{75} = \sqrt{3 \cdot 75} = \sqrt{3 \cdot 3 \cdot 25} = 3 \cdot 5 = 15$

c)  $\sqrt{96} : \sqrt{6} = \sqrt{96 : 6} = \sqrt{16} = 4$

2) siehe Blatt

3) siehe Blatt

4a)

$$x^2 - 3x - 10 = 0$$

$$x_{1/2} = \frac{3 \pm \sqrt{9 - 4 \cdot 1 \cdot (-10)}}{2} = \frac{3 \pm 7}{2}; \quad x_1 = 5; \quad x_2 = -2;$$

4b)

$$-0,5x^2 + x + 7 = 3x$$

$$-0,5x^2 - 2x + 7 = 0;$$

$$x_{1/2} = \frac{2 \pm \sqrt{4 - 4 \cdot (-0,5) \cdot (7)}}{2 \cdot (-0,5)} = \frac{2 \pm \sqrt{18}}{-1} = \frac{2 \pm 3\sqrt{2}}{-1}; \quad x_1 = -2 - 3\sqrt{2}; \quad x_2 = -2 + 3\sqrt{2};$$

5) Senkt die Firma den Preis um  $n \cdot 0,10$  € pro Bauteil, dann steigt der Absatz um  $n \cdot 20$  Bauteile. Für die Einnahmen in € gelten dann:

$$y = \underbrace{(800 + 20n)} \cdot \underbrace{(10 - n \cdot 0,10)}$$

Anzahl der Bauteile      Preis pro Bauteil

$$y = 8000 + 200n - 80n - 2n^2$$

$$y = -2n^2 + 120n + 8000$$

$$y = -2(n^2 - 60n - 4000)$$

$$y = -2(n^2 - 60n + 30^2 - 30^2 - 4000)$$

$$y = -2(n^2 - 60n + 30^2 - 4900)$$

$$y = -2(n - 30)^2 + 9800$$

Scheitel der zugehörigen Parabel: S(30/9800)

Bei einer Preissenkung von  $30 \cdot 0,10$  € pro Bauteil, sind die Einnahmen maximal und betragen dann 9800 €.

6)

$$y = x - 1,5$$

$$y = x^2 - 4x + 2,5$$

Rechnerisch:

$$x - 1,5 = x^2 - 4x + 2,5$$

$$0 = x^2 - 5x + 4$$

$$x_{1/2} = \frac{5 \pm \sqrt{25 - 4 \cdot 1 \cdot 4}}{2} = \frac{5 \pm 3}{2};$$

$$x_1 = 4; \quad y_1 = 4 - 1,5 = 2,5; \quad P_1(4/2,5)$$

$$x_2 = 1; \quad y_2 = 1 - 1,5 = -0,5; \quad P_2(1/-0,5)$$

Graphisch:

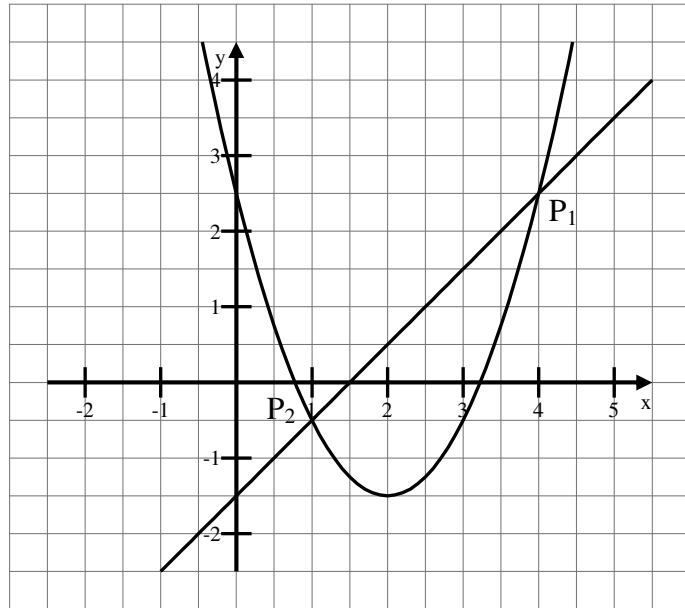
Gerade g :  $y = x - 1,5$

Parabel p :  $y = x^2 - 4x + 2,5$

$$y = x^2 - 4x + 4 - 4 + 2,5$$

$$y = (x - 2)^2 - 1,5$$

S(2/-1,5)



7a)

$$\sqrt[3]{27z^9} \cdot (z^{-2})^{\frac{3}{2}} = 27^{\frac{1}{3}} z^{\frac{9}{3}} z^{(-2) \cdot \frac{3}{2}} = 3 \cdot z^3 \cdot z^{-3} = 3;$$

7b)

$$x^{\frac{1}{2}} \cdot x^{\frac{3}{4}} \cdot \sqrt[4]{x} = x^{\frac{1}{2} + \frac{3}{4}} \cdot x^{\frac{1}{4}} = x^{\frac{2}{4} + \frac{3}{4} + \frac{1}{4}} = x^{\frac{3}{2}} = \sqrt{x^3};$$

7c)

$$\sqrt{a} \cdot \sqrt[3]{a} : a^{-\frac{1}{6}} = a^{\frac{1}{2}} a^{\frac{1}{3}} : a^{-\frac{1}{6}} = a^{\frac{1}{2} + \frac{1}{3} - (-\frac{1}{6})} = a^{\frac{5}{6} + \frac{1}{6}} = a;$$

## Seite 2

1a)

$$a = 4\text{cm}; b = 3\text{cm}$$

$$a^2 + b^2 = c^2; \quad c = \sqrt{a^2 + b^2} = \sqrt{(4\text{cm})^2 + (3\text{cm})^2} = 5\text{cm};$$

$$a^2 = cp; \quad p = \frac{a^2}{c} = \frac{(4\text{cm})^2}{5\text{cm}} = 3,2\text{cm};$$

$$q = c - p = 5\text{cm} - 3,2\text{cm} = 1,8\text{cm};$$

$$h^2 = qp; \quad h = \sqrt{qp} = \sqrt{1,8\text{cm} \cdot 3,2\text{cm}} = 2,4\text{cm}.$$

1b)

$$p = 2\text{cm}; h = 5\text{cm}$$

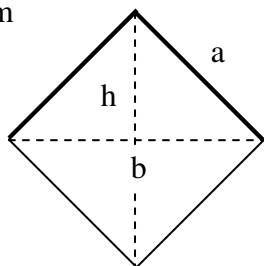
$$h^2 = qp; \quad q = \frac{h^2}{p} = \frac{(5\text{cm})^2}{2\text{cm}} = 12,5\text{cm};$$

$$c = q + p = 12,5\text{cm} + 2\text{cm} = 14,5\text{cm};$$

$$a^2 = cp; \quad a = \sqrt{cp} = \sqrt{14,5\text{cm} \cdot 2\text{cm}} = \sqrt{29\text{cm}} \approx 5,4\text{cm};$$

$$a^2 + b^2 = c^2; \quad b = \sqrt{c^2 - a^2} = \sqrt{(14,5\text{cm})^2 - (\sqrt{29\text{cm}})^2} \approx 13,5\text{cm}.$$

2)  $b = 9,8\text{m}$



$$h = b : 2 = 9,8\text{m} : 2 = 4,9\text{m};$$

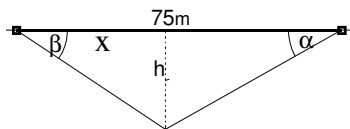
$$a^2 + a^2 = b^2; \quad 2a^2 = b^2; \quad a = \sqrt{b^2 : 2} = b : \sqrt{2} = 9,8\text{m} : \sqrt{2} \approx 6,9\text{m}.$$

3)

$$\text{a) } \sin \alpha = \frac{a}{b}; \quad \alpha = \sin^{-1} \frac{2\text{cm}}{7\text{cm}} \approx 16,60^\circ;$$

$$\text{b) } \tan \alpha = \frac{a}{c}; \quad \alpha = \tan^{-1} \frac{2\text{cm}}{4\text{cm}} \approx 26,57^\circ;$$

4)  $\alpha = 34^\circ; \beta = 40^\circ$



I)  $\tan \alpha = \frac{h}{75m - x};$

II)  $\tan \beta = \frac{h}{x};$

I')  $h = (75m - x) \cdot \tan \alpha;$

II')  $h = x \cdot \tan \beta;$

$(75m - x) \cdot \tan \alpha = x \cdot \tan \beta;$

$75m \cdot \tan \alpha - x \cdot \tan \alpha = x \cdot \tan \beta;$

$75m \cdot \tan \alpha = x \cdot \tan \beta + x \cdot \tan \alpha;$

$75m \cdot \tan \alpha = x(\tan \beta + \tan \alpha);$

$x = \frac{75m \cdot \tan \alpha}{\tan \beta + \tan \alpha} = \frac{75m \cdot \tan 34^\circ}{\tan 40^\circ + \tan 34^\circ} \approx 33,4m$

$h = \tan \beta \cdot x = \tan 40^\circ \cdot 33,4m \approx 28m$

5a)

$h = 5dm; \quad r = 7cm = 0,7dm$

$V = \pi r^2 h = \pi(0,7dm)^2 \cdot 5dm \approx 7,7dm^3;$

$O = 2\pi r^2 + 2\pi r h = 2\pi(0,7dm)^2 + 2\pi \cdot 0,7dm \cdot 5dm \approx 25,1dm^2$

5b)

$h = 2m; \quad r = 0,8m$

$V = \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi(0,8m)^2 \cdot 2m \approx 1,34m^3;$

$O = \pi r^2 + \pi r h$

$m = \sqrt{r^2 + h^2} = \sqrt{(0,8m)^2 + (2m)^2} \approx 2,15m;$

$O = \pi(0,8m)^2 + \pi \cdot 0,8m \cdot 2,15m \approx 7,4m^2;$

5c)

$h = 10cm; \quad s = 6cm$

$V = \frac{1}{3} G \cdot h = \frac{1}{3} \cdot 6 \cdot \frac{1}{2} s h_s \cdot h = s h_s h$

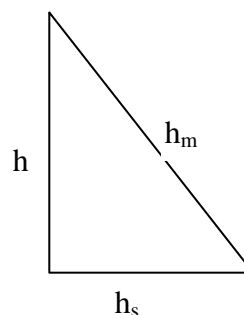
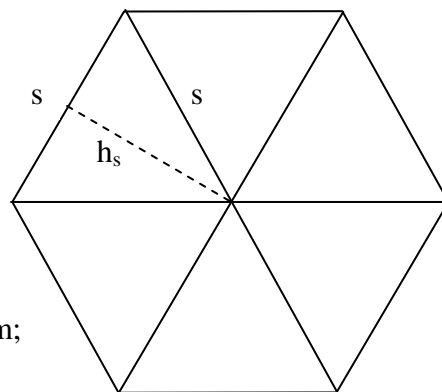
$h_s = \sqrt{s^2 - \left(\frac{1}{2}s\right)^2} = \sqrt{\frac{3}{4}s^2} = \frac{1}{2}\sqrt{3}s = \frac{1}{2}\sqrt{3} \cdot 6cm = 3\sqrt{3}cm;$

$V = 6cm \cdot 3\sqrt{3}cm \cdot 10cm = 180\sqrt{3}cm^3 \approx 312cm^3;$

$O = G + M = 6 \cdot \frac{1}{2}s \cdot h_s + 6 \cdot \frac{1}{2}s \cdot h_m = 3s \cdot h_s + 3s \cdot h_m;$

$h_m = \sqrt{h^2 + h_s^2} = \sqrt{(10cm)^2 + (3\sqrt{3}cm)^2} = \sqrt{127}cm;$

$O = 3 \cdot 6cm \cdot 3\sqrt{3}cm + 3 \cdot 6cm \cdot \sqrt{127}cm \approx 296cm^2$



5d)

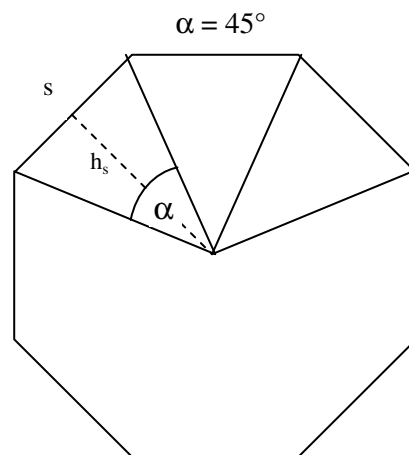
$$h = 5\text{cm}; \quad s = 4\text{cm}$$

$$V = G \cdot h = 8 \cdot \frac{1}{2} s \cdot h_s \cdot h = 4s \cdot h_s \cdot h$$

$$\tan \frac{\alpha}{2} = \frac{0,5 \cdot s}{h_s};$$

$$h_s = \frac{0,5 \cdot s}{\tan \frac{\alpha}{2}} = \frac{2\text{cm}}{\tan 22,5^\circ} \approx 4,8\text{cm};$$

$$V = 4 \cdot 4\text{cm} \cdot 4,8\text{cm} \cdot 5\text{cm} = 384\text{cm}^3$$



$$O = 2G + M = 2 \cdot 8 \cdot \frac{1}{2} s \cdot h_s + 8 \cdot sh = 8s \cdot h_s + 8s \cdot h = 8s(h_s + h) = 8 \cdot 4\text{cm}(4,8\text{cm} + 5\text{cm}) \approx 314\text{cm}^2$$

6)

$$\text{a) } \frac{5}{6} \cdot \frac{5}{6} \cdot \frac{5}{6} \approx 57,9\% ;$$

$$\text{b) } \frac{5}{6} \cdot \frac{5}{6} \cdot \frac{1}{6} \cdot 3 \approx 34,7\% ;$$

$$\text{c) aus a) und b): } 57,9\% + 34,7\% = 92,6\%$$

$$\text{d) } 1 - \left(\frac{5}{6}\right)^3 \approx 42,1\%$$

7)

$$0,15 \cdot 0,20 \cdot 0,70 + 0,15 \cdot 0,80 \cdot 0,30 + 0,85 \cdot 0,20 \cdot 0,30 = 10,8\%$$