

### Lösungen der Vektorrechnung

1) a)  $\underline{\underline{|\vec{a}| = 5}}$       b)  $\underline{\underline{m = 0}}$       c)  $\underline{\underline{\varphi = 0^\circ}}$

2) a)  $\underline{\underline{|\vec{a}| = \sqrt{45} \approx 6,7}}$       b)  $\underline{\underline{m = \frac{1}{2}}}$       c)  $\underline{\underline{\varphi = 26^\circ 33' 54,2''}}$

3)

a)  $\underline{\underline{\vec{r}_2 - \vec{r}_1 = \begin{pmatrix} 4 \\ 0 \end{pmatrix}}}$       b)  $\underline{\underline{\vec{r}_1 - \vec{r}_2 = \begin{pmatrix} -4 \\ 0 \end{pmatrix}}}$

c)  $\underline{\underline{\vec{r}_1 \cdot \vec{r}_2 = 9}}$       d)  $\underline{\underline{\vec{r}_2 \cdot \vec{r}_1 = 9}}$

e)  $\underline{\underline{\vec{r}_1 \times \vec{r}_2 = \begin{pmatrix} 0 \\ 0 \\ -12 \end{pmatrix}}}$       f)  $\underline{\underline{\vec{r}_2 \times \vec{r}_1 = \begin{pmatrix} 0 \\ 0 \\ 12 \end{pmatrix}}}$

4)

a)  $A = a \cdot b \pm ab \left( \frac{\Delta a}{a} + \frac{\Delta b}{b} \right) = \underline{\underline{(16 \pm 2) \text{ cm}^2}}$

b)  $B = a + b \pm (\Delta a + \Delta b) = \underline{\underline{(8,2 \pm 0,4) \text{ cm}}}$

c)  $C = ab + bc = a \cdot b + bc \pm \left[ ab \left( \frac{\Delta a}{a} + \frac{\Delta b}{b} \right) + bc \left( \frac{\Delta b}{b} + \frac{\Delta c}{c} \right) \right] = \underline{\underline{(29 \pm 4) \text{ cm}^2}}$

d)  $D = \frac{a}{b} + bc$  (unmöglich)

e)  $E = \frac{a}{b} - \frac{b}{c} \pm \left[ \frac{a}{b} \left( \frac{\Delta a}{a} + \frac{\Delta b}{b} \right) + \frac{b}{c} \left( \frac{\Delta b}{b} + \frac{\Delta c}{c} \right) \right] = \underline{\underline{0,8 \pm 0,3}}$

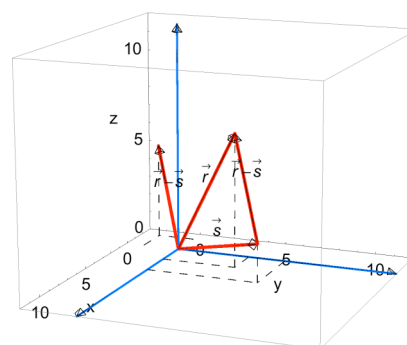
5)

d)  $\underline{\underline{\vec{r} \cdot \vec{s} = 46}}$

e)  $\underline{\underline{\vec{s} \cdot \vec{r} = 46}}$

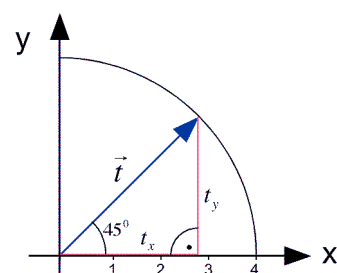
f)  $\underline{\underline{\vec{r} \times \vec{s} = \begin{pmatrix} -34 \\ 24 \\ -4 \end{pmatrix}}}$

g)  $\underline{\underline{\vec{s} \times \vec{r} = \begin{pmatrix} 34 \\ -24 \\ 4 \end{pmatrix}}}$



6)

$\underline{\underline{\vec{t} = \begin{pmatrix} 2\sqrt{2} \\ 2\sqrt{2} \end{pmatrix}}}$



7)

$$a) \quad \underline{\underline{\vec{a} + \vec{b} = \begin{pmatrix} 6 \\ 4 \\ 9 \end{pmatrix}}}$$

$$b) \quad \underline{\underline{\vec{a} - \vec{b} = \begin{pmatrix} -2 \\ -10 \\ -1 \end{pmatrix}}}$$

$$c) \quad \underline{\underline{\vec{b} - \vec{a} = \begin{pmatrix} 2 \\ 10 \\ 1 \end{pmatrix}}}$$

$$d) \quad \underline{\underline{5(\vec{a} + \vec{b}) = \begin{pmatrix} 30 \\ 20 \\ 45 \end{pmatrix}}}$$

$$e) \quad \underline{\underline{-5(\vec{a} + \vec{b}) = \begin{pmatrix} -30 \\ -20 \\ -45 \end{pmatrix}}}$$

$$f) \quad \underline{\underline{\vec{a} \cdot \vec{b} = 7}}$$

$$g) \quad \underline{\underline{\vec{b} \cdot \vec{a} = 7}}$$

$$h) \quad \underline{\underline{\vec{a} \times \vec{b} = \begin{pmatrix} -43 \\ 6 \\ 26 \end{pmatrix}}}$$

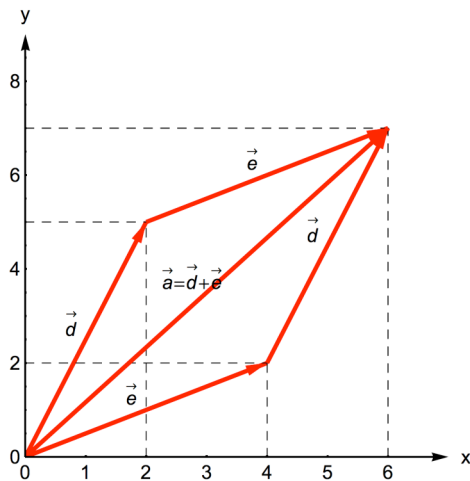
$$i) \quad \underline{\underline{\vec{b} \times \vec{a} = -\vec{a} \times \vec{b} = \begin{pmatrix} 43 \\ -6 \\ -26 \end{pmatrix}}}$$

$$j) \quad \underline{\underline{|\vec{a} \times \vec{b}| = \sqrt{2561} \approx 50,61}}$$

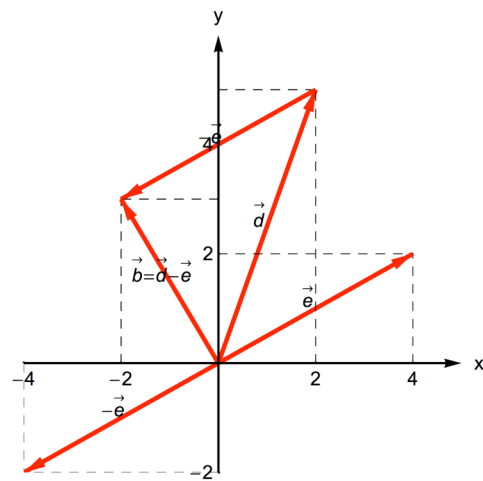
$$k) \quad \underline{\underline{|\vec{b} \times \vec{a}| = \sqrt{2561} \approx 50,61}}$$

8)

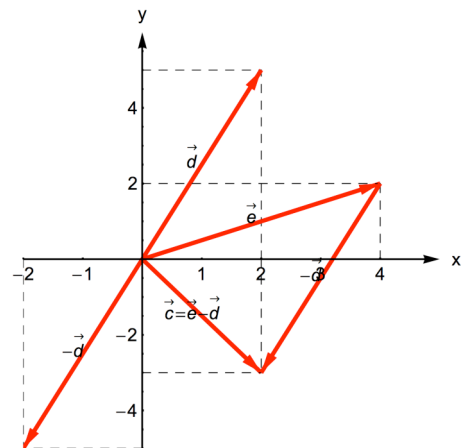
$$a) \quad \vec{a} = \vec{d} + \vec{e}$$



$$b) \quad \vec{b} = \vec{d} - \vec{e}$$



$$c) \quad \vec{c} = \vec{e} - \vec{d}$$



$$d) \quad \underline{\underline{|\vec{d}| = \sqrt{29}}}$$

$$e) \quad \underline{\underline{|\vec{e}| = \sqrt{20}}}$$

$$f) \quad \underline{\underline{\vec{d} \cdot \vec{e} = 18}}$$

$$g) \quad \underline{\underline{\vec{e} \cdot \vec{d} = 18}}$$

$$h) \quad \underline{\underline{\vec{d} \times \vec{e} = \begin{pmatrix} 0 \\ 0 \\ -16 \end{pmatrix}}}$$

$$i) \quad \underline{\underline{\vec{e} \times \vec{d} = \begin{pmatrix} 0 \\ 0 \\ 16 \end{pmatrix}}}$$

$$j) \quad \underline{\underline{|\vec{d} \times \vec{e}| = 16}}$$

$$k) \quad \underline{\underline{|\vec{e} \times \vec{d}| = 16}}$$