

S 294 Nr. 1

$$a.) \cos d = \frac{\vec{a} \cdot \vec{b}}{|\vec{a}| \cdot |\vec{b}|} = \frac{\begin{pmatrix} 5 \\ 0 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 3 \end{pmatrix}}{\sqrt{5^2+0^2} \cdot \sqrt{1^2+3^2}} = \frac{5 \cdot 1 + 0 \cdot 3}{5 \cdot \sqrt{10}} = \frac{1}{\sqrt{10}}$$

$$d = \arccos\left(\frac{1}{\sqrt{10}}\right) \approx \underline{\underline{71,57^\circ}}$$

$$b.) \cos d = \frac{\vec{a} \cdot \vec{b}}{|\vec{a}| \cdot |\vec{b}|} = \frac{1 \cdot 2 + 3 \cdot 5 + 1 \cdot 1}{\sqrt{1^2+3^2+1^2} \cdot \sqrt{2^2+5^2+1^2}} = \frac{18}{\sqrt{11} \cdot \sqrt{30}}$$

$$d = \arccos\left(\frac{18}{\sqrt{11} \cdot \sqrt{30}}\right) = \arccos\left(\frac{18}{\sqrt{11 \cdot 30}}\right) \approx \underline{\underline{7,75^\circ}}$$

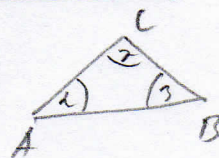
$$c.) \cos d = \frac{\begin{pmatrix} 1 \\ 3 \\ 5 \end{pmatrix} \cdot \begin{pmatrix} 5 \\ 3 \\ 1 \end{pmatrix}}{\sqrt{1^2+3^2+5^2} \cdot \sqrt{5^2+3^2+1^2}} = \frac{1 \cdot 5 + 3 \cdot 3 + 5 \cdot 1}{\sqrt{35} \cdot \sqrt{35}} = \frac{19}{35}$$

$$d = \arccos\left(\frac{19}{35}\right) \approx \underline{\underline{57,12^\circ}}$$

$$d.) \cos d = \frac{\begin{pmatrix} -11 \\ 4 \\ 1 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}}{\sqrt{(-11)^2+4^2+1^2} \cdot \sqrt{1^2+2^2+3^2}} = \frac{-11 \cdot 1 + 4 \cdot 2 + 1 \cdot 3}{\sqrt{138} \cdot \sqrt{14}} = \frac{0}{\sqrt{138} \cdot \sqrt{14}}$$

$$d = \arccos(0) = \underline{\underline{90^\circ}}$$

S 294 Nr. 2 A(2|1), B(5|-1), C(4|3)



Skizze

$$a.) |\vec{AB}| = \sqrt{(5-2)^2 + (-1-1)^2} = \underline{\underline{\sqrt{13}}}$$

$$|\vec{AC}| = \sqrt{(4-2)^2 + (3-1)^2} = \underline{\underline{\sqrt{8}}} = \underline{\underline{\sqrt{4 \cdot 2}}} = \underline{\underline{2\sqrt{2}}}$$

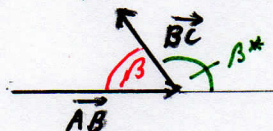
$$|\vec{BC}| = \sqrt{(4-5)^2 + (3-(-1))^2} = \underline{\underline{\sqrt{17}}}$$

$$\cos d = \frac{\vec{AB} \cdot \vec{AC}}{|\vec{AB}| \cdot |\vec{AC}|} = \frac{3 \cdot 2 + (-2) \cdot 2}{\sqrt{13} \cdot \sqrt{8}} = \frac{2}{\sqrt{13} \cdot \sqrt{8}} \Rightarrow d = \arccos\left(\frac{2}{\sqrt{13} \cdot \sqrt{8}}\right) \approx \underline{\underline{78,69^\circ}}$$

$$\cos \beta^* = \frac{\vec{AB} \cdot \vec{BC}}{|\vec{AB}| \cdot |\vec{BC}|} = \frac{\begin{pmatrix} 5-2 \\ -1-1 \end{pmatrix} \cdot \begin{pmatrix} 4-5 \\ 3-(-1) \end{pmatrix}}{\sqrt{13} \cdot \sqrt{17}} = \frac{\begin{pmatrix} 3 \\ -2 \end{pmatrix} \cdot \begin{pmatrix} -1 \\ 4 \end{pmatrix}}{\sqrt{13} \cdot \sqrt{17}} = \frac{3 \cdot (-1) + (-2) \cdot 4}{\sqrt{13} \cdot \sqrt{17}} = \frac{-11}{\sqrt{221}}$$

$$\beta^* = \arccos\left(\frac{-11}{\sqrt{221}}\right) \approx 137,73^\circ$$

$$\beta = 180^\circ - \beta^* \approx \underline{\underline{42,27^\circ}}$$



$$\delta = 180^\circ - d - \beta \approx \underline{\underline{59,04^\circ}}$$