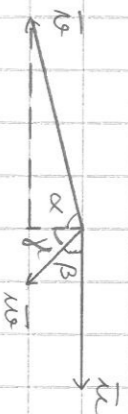


- 16.16
- a)  $\vec{x} = \vec{BD} : \vec{BD}, \vec{FH}$   
 b)  $|\vec{y}| = |\vec{ED}|, \vec{x} \perp \vec{ED} : \vec{DE}, \vec{CF}$   
 c)  $\vec{z} = -\vec{DF} : \vec{FD}$   
 d)  $\vec{AG}, \vec{GA}, \vec{BH}, \vec{HB}, \vec{CE}, \vec{EC}, \vec{DF}, \vec{FD}$

18.7

- A = (-14, 34), B = (22, -43), C = (4, 85), D = (44, 12)
- a)  $\vec{AB} = (22 - (-14))\vec{i} + (-43 - 34)\vec{j} = 36\vec{i} - 77\vec{j}$   
 $|\vec{AB}| = \sqrt{36^2 + (-77)^2} = 85$   
 b)  $\vec{CD} = (44 - 4)\vec{i} + (12 - 85)\vec{j} = 40\vec{i} - 73\vec{j}$   
 $|\vec{CD}| = \sqrt{(40)^2 + (-73)^2} = 85 \quad |(\cdot)^2$   
 c)  $9x^2 + 5929 = 7225 \Rightarrow x^2 = 144 \quad | \sqrt{\quad} \Rightarrow x = \pm 12$

16.17

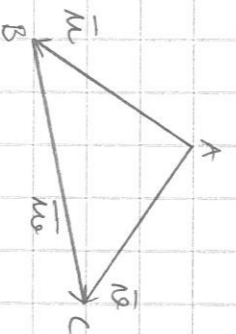


- 16.17 a)  $|\vec{a}| = 3$   
 $|\vec{b}| = \sqrt{4^2 + 1^2} = \sqrt{17}$   
 $|\vec{a} \cdot \vec{b}| = \sqrt{1^2 + 1^2} = \sqrt{2}$
- b)  $\tan \alpha = \frac{4}{1} = 4 \Rightarrow \alpha = 75.96^\circ \approx 76^\circ$   
 $\angle (\vec{a}, \vec{b}) = 90^\circ + \alpha \approx 166^\circ$   
 $\angle (\vec{a}, \vec{b}) = \beta = 45^\circ$   
 $\angle (\vec{a}, \vec{b}) = \alpha + \beta \approx 76^\circ + 45^\circ = 121^\circ$

18.11

- A = (3, 0),  $\vec{AB} = 5\vec{i} - 2\vec{j}$ ,  $\vec{BC} = -\vec{i} + 8\vec{j}$
- a) B = (3 + 5, 0 - 2) = (8, -2)  
 C = (8 - 1, -2 + 8) = (7, 6)
- b)  $|\vec{AB}| = \sqrt{5^2 + (-2)^2} = \sqrt{29}$   
 $|\vec{BC}| = \sqrt{(-1)^2 + 8^2} = \sqrt{65}$  ← *größerer*  
 $\vec{AC} = (7 - 3)\vec{i} + (6 - 0)\vec{j} = 4\vec{i} + 6\vec{j} \Rightarrow |\vec{AC}| = \sqrt{4^2 + 6^2} = \sqrt{52}$   
 $|\vec{BC}|^2 = |\vec{AB}|^2 + |\vec{AC}|^2 \Leftrightarrow 65 = 29 + 52 \quad \checkmark$   
 $\Rightarrow$  *Rechtwinklig* *mit* *rechter* *Winkel* *bei* *B* *Pythagoras* *Laufstra*  
 $\Rightarrow$  *Rechte* *Winkel* *dreieck*

16.18



- 16.18 a)  $\angle A = \angle (\vec{a}, \vec{b})$   
 b)  $\angle B = \angle (\vec{b}, \vec{c})$   
 c)  $\angle C = \angle (\vec{c}, \vec{a}) = \angle (\vec{c}, -\vec{a}) = \angle (\vec{c}, \vec{a})$

18.21

- A = (3, 4), B = (5, -1), C = (-2, 5)
- 1° *Summenbar* ABCD  
 $\vec{AD} = \vec{BC} = (-2 - 5)\vec{i} + (5 - (-1))\vec{j} = -7\vec{i} + 6\vec{j}$   
 $\Rightarrow D = (3 - 7, 4 + 6) = (-4, 10)$
- 2° *Summenbar* AEB C  
 $\vec{AE} = \vec{CB} = 7\vec{i} - 6\vec{j}$   
 $\Rightarrow E = (3 + 7, 4 - 6) = (10, -2)$
- 3° *Summenbar* ABFC  
 $\vec{CF} = \vec{AB} = (5 - 3)\vec{i} + (-1 - 4)\vec{j} = 2\vec{i} - 5\vec{j}$   
 $\Rightarrow F = (-2 + 2, 5 - 5) = (0, 0)$

17.8

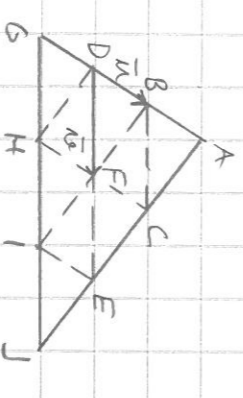


- 17.8 a)  $\vec{PR} = 4\vec{a} - 3\vec{b} : 2$  b)  $\vec{RP} = -4\vec{a} + 3\vec{b} : 3$   
 c)  $\vec{SQ} = 4\vec{a} + 3\vec{b} : 1$  d)  $\vec{QS} = -4\vec{a} - 3\vec{b} : 5$

18.20

- A = (-2, 4), B = (3, -1), C = (5, 6)
- $\vec{AD} = \vec{BC} = (5 - 3)\vec{i} + (6 - (-1))\vec{j} = 2\vec{i} + 7\vec{j}$   
 $\Rightarrow D = (-2 + 2, 4 + 7) = (0, 11)$
- $\vec{a} = 2\vec{i} + 4\vec{j}$   
 $\vec{b} = 4\vec{i} + 2\vec{j}$

17.13



- 17.13 a)  $\vec{CI} = -2\vec{a} + \vec{b} : 4$   
 b)  $\vec{FI} = -\vec{a} + 2\vec{b} : 5$   
 c)  $\vec{HI} = 2\vec{a} - \vec{b} : 2$   
 d)  $\vec{GC} = 2\vec{a} + \vec{b} : 1$

19.4

- $\sin 60^\circ = \frac{a}{5} \Rightarrow a = 5 \sin 60^\circ \approx 4.330$   
 $\Rightarrow \vec{a} \approx 4.3\vec{j}$
- $\cos 60^\circ = \frac{x}{5} \Rightarrow x = 5 \cos 60^\circ = 2.5$   
 $\Rightarrow \vec{a}_x = 2.5\vec{i}$
- $\vec{a} = 2.5\vec{i} + 4.3\vec{j}$

- 18.1 a) A = (2, 7),  $\vec{OA} = 2\vec{i} + 7\vec{j}$ ,  $|\vec{OA}| = \sqrt{2^2 + 7^2} = \sqrt{53}$   
 b) B = (3, -5),  $\vec{OB} = 3\vec{i} - 5\vec{j}$ ,  $|\vec{OB}| = \sqrt{3^2 + (-5)^2} = \sqrt{34}$   
 c) C = (-9, 0),  $\vec{OC} = -9\vec{i}$ ,  $|\vec{OC}| = 9$   
 d) D = ( $\sqrt{5}$ , -2),  $\vec{OD} = \sqrt{5}\vec{i} - 2\vec{j}$ ,  $|\vec{OD}| = \sqrt{(\sqrt{5})^2 + (-2)^2} = \sqrt{9} = 3$

19.6

- a)  $\vec{a} = -3\vec{i} + 9\vec{j}$ ,  $\vec{b} = \vec{i} - \vec{j}$ ,  $\vec{c} = \vec{j}$   
 $\vec{a} = x\vec{i} + y\vec{b}$   
 $\Rightarrow \begin{cases} -3 = x \\ 9 = -x + y \end{cases} \Rightarrow y = 3 + 3 = 6 \Rightarrow \vec{a} = -3\vec{i} + 6\vec{b}$

18.3

- 18.3 A = (-5, 4),  $\vec{AH} = 3\vec{i} + 23\vec{j}$   
 $\Rightarrow H = (-5 + 9, 4 + 23) = (4, 27)$

18.5

- a) A = (9, 13), B = (5, 3)  
 $\vec{AB} = (5 - 9)\vec{i} + (3 - 13)\vec{j} = -4\vec{i} - 10\vec{j}$   
 $\vec{PO} = \vec{AB} \Rightarrow \vec{OP} = -\vec{AB} = 4\vec{i} + 10\vec{j} \Rightarrow P = (4, 10)$
- b)  $\vec{PA} = (x - 9)\vec{i} + (y - 13)\vec{j}$   
 $\vec{PB} = (x - 5)\vec{i} + (y - 3)\vec{j}$   
 $|\vec{PA}| = |\vec{PB}| \Rightarrow \sqrt{(x - 9)^2 + (y - 13)^2} = \sqrt{(x - 5)^2 + (y - 3)^2}$   
 $\Rightarrow \begin{cases} -x = -4 \\ -y = -10 \end{cases} \Rightarrow \begin{cases} x = 4 \\ y = 10 \end{cases} \Rightarrow P = (4, 10)$

19.16

- $\vec{a} = 16\vec{i} - 6\vec{j}$ ,  $\vec{b} = -\vec{i} + \vec{j}$ ,  $\vec{c} = \vec{i} + \vec{j}$   
 $\vec{a} = x\vec{b} + y\vec{c}$   
 $\Rightarrow \begin{cases} 16 = -x + y \\ -6 = x + y \end{cases} \Rightarrow \begin{cases} 11 = 2y \\ 10 = 2y \end{cases} \Rightarrow \begin{cases} y = 5.5 \\ x = -11 \end{cases}$   
 $\Rightarrow \vec{a} = -11\vec{b} + 5.5\vec{c}$