

Uppgift 1.1

$$\vec{A} = (2, -1, -2) \quad \vec{B} = (0, -3, 4) \quad \vec{C} = (1, -1, 2)$$

$$a) \vec{e}_A = \frac{\vec{A}}{|\vec{A}|} = \frac{(2, -1, -2)}{\sqrt{2^2 + (-1)^2 + (-2)^2}} = \frac{1}{3} (2, -1, -2)$$

$$\vec{e}_B = \frac{\vec{B}}{|\vec{B}|} = \frac{(0, -3, 4)}{\sqrt{(-3)^2 + 4^2}} = \frac{1}{5} (0, -3, 4) \quad \boxed{\vec{e}_A = \frac{1}{3} (2, -1, -2) \quad \vec{e}_B = \frac{1}{5} (0, -3, 4)}$$

$$b) \vec{A} \cdot \vec{B} = AB \cos \theta$$

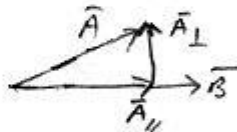
$$\cos \theta = \frac{\vec{A} \cdot \vec{B}}{AB} = \frac{(2, -1, -2) \cdot (0, -3, 4)}{3 \cdot 5} = \frac{2 \cdot 0 + (-1) \cdot (-3) + (-2) \cdot 4}{3 \cdot 5} = \frac{-5}{15} = -\frac{1}{3}$$

$$\boxed{\theta = \arccos(-1/3)}$$

$$c) \vec{A}_{\parallel} = \underbrace{(\vec{A} \cdot \vec{e}_B)}_{\text{proj av } \vec{A} \text{ p } \vec{B}} \vec{e}_B = \frac{(2, -1, -2) \cdot (0, -3, 4)}{5} \frac{(0, -3, 4)}{5} = -1 \frac{(0, -3, 4)}{5} = \frac{1}{5} (0, 3, -4)$$

$$\vec{A}_{\perp} = \vec{A} - \vec{A}_{\parallel} = (2, -1, -2) - \frac{1}{5} (0, 3, -4) = \frac{1}{5} (10, -8, -6) = \frac{2}{5} (5, -4, -3)$$

$$\boxed{\vec{A}_{\parallel} = \frac{1}{5} (0, 3, -4) \quad \vec{A}_{\perp} = \frac{2}{5} (5, -4, -3)}$$



$$d) \vec{D} \text{ s } z\text{-komponent} = 0 \quad \vec{D} \text{ är } \vec{A} \text{ s projektion i } xy\text{-planet}$$

$$\boxed{\vec{D} = (2, -1, 0)}$$

$$e) \vec{A} \times \vec{B} = \begin{vmatrix} \vec{e}_x & \vec{e}_y & \vec{e}_z \\ 2 & -1 & -2 \\ 0 & -3 & 4 \end{vmatrix} = (-1 \cdot 4 - (-2) \cdot (-3), -2 \cdot 0 - 2 \cdot 4, 2 \cdot (-3) - (-1) \cdot 0) = (-10, -8, -6) = -2(5, 4, 3)$$

$$\boxed{\vec{A} \times \vec{B} = -2(5, 4, 3)}$$

$$\vec{e}_x \equiv \vec{i} \quad \vec{e}_y \equiv \vec{j} \quad \vec{e}_z \equiv \vec{k}$$

$$f) V = |\vec{A} \times \vec{B} \cdot \vec{C}| \quad \text{eller} \quad V = |\vec{A} \times \vec{C} \cdot \vec{B}| \quad \text{eller} \quad V = |\vec{B} \times \vec{C} \cdot \vec{A}|$$

$$V = |\vec{A} \times \vec{B} \cdot \vec{C}| = |-2(5, 4, 3) \cdot (1, -1, 2)| = |-2(5 - 4 + 6)| = |-14| = 14$$

$$\boxed{V = 14}$$

$$g) \vec{A} \times (\vec{B} \times \vec{C}) = \vec{B}(\vec{A} \cdot \vec{C}) - \vec{C}(\vec{A} \cdot \vec{B}) = (0, -3, 4)(2 + 1 - 4) - (1, -1, 2)(1 - 5) = (0, 3, -4) + (5, -5, 10) = (5, -2, 6)$$

$$GK \quad \boxed{\vec{A} \times (\vec{B} \times \vec{C}) = (5, -2, 6)}$$

Kan även beräknas med triple vektorprodukt.