

3.26)

$$P = 3i_1 - j_1 + 2k$$

$$R = 4i_1 + 5j_1 - 3k$$

$$S = -2i_1 + 3j_1 - k$$

LUCAS LIMA

$$P \cdot Q = (3i - j + 2k) \cdot (4i + 5j - 3k) =$$

$$12 - 5 - 6 = 1$$

$$P \cdot S = -6 - 3 - 2 = -11$$

$$Q \cdot S = -8 + 15 + 3 = 10$$

3.28)

$$\vec{A} = (0; -0,6; 0)$$

$$\vec{B} = (0,45; 0; 0)$$

$$\vec{C} = (0; 0; -0,32)$$

$$\vec{D} = (-0,5; 0; 0,36)$$

$$\vec{AB} = (0,45; 0,6; 0)$$

$$\vec{AD} = (-0,5; 0,6; 0,36)$$

$$\vec{AB} \cdot \vec{AD} = 0,135$$

$$|\vec{AB}| = 0,75$$

$$|\vec{AD}| = 0,86$$

$$\cos \theta = \frac{\vec{AB} \cdot \vec{AD}}{|\vec{AB}| \cdot |\vec{AD}|} = 0,2093$$

$$\theta = 77,92^\circ$$

3.30)

$$\vec{A} (280; 0; 0)$$

$$\vec{B} (780; 0; 0)$$

$$\vec{C} (0; 300; -600)$$

$$\vec{AC} = (-280; 300; -600)$$

$$\vec{BC} = (-780; 300; -600)$$

$$AC \cdot BC = 662.400$$

$$a) \cos \theta = 0,894$$

$$|\vec{AC}| = 726,91 \text{ mm}$$

$$|\vec{BC}| = 1020,20 \text{ mm}$$

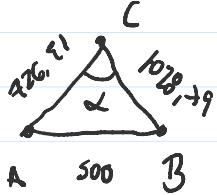
$$a) \cos \theta = 0,894$$

$$\theta = 26,65^\circ$$

$$|\vec{AC}| = 726,91 \text{ mm}$$

$$|\vec{BC}| = 1028,79 \text{ mm}$$

b)



$$500^2 = (726,91)^2 + (1028,79)^2 - 2 \cdot 726,91 \cdot 1028,79 \cdot \cos \alpha$$

$$\cos \alpha \approx 0,894$$

$$\alpha \approx 26,65^\circ$$

3.32

$$|\vec{AC}| = 1260 \text{ N}$$

$$\vec{AC} = (-280; 300; -600)$$

$$\vec{AB} = (500; 0; 0)$$

$$|\vec{AC}| = 726,91 \text{ mm}$$

$$|\vec{AB}| = 500 \text{ mm}$$

Wear Limp

$$a) \cos \theta = \frac{\vec{AC} \cdot \vec{AB}}{|\vec{AC}| \cdot |\vec{AB}|} = \frac{-140000}{363455} = -0,3852$$

$$b) \text{Projektião} = \vec{AC} \cdot \cos \theta = -485,352$$

3.9) a)

$$\vec{F} = (733 \cos \theta_i - 133 \sin \theta_j) \text{ N}$$

$$F_2 = 133 \text{ i N}$$

$$\vec{v}_1 = (-0,203 \sin \theta_i + 0,203 \cos \theta_j + 0,304 \text{ k})$$

$$\vec{v}_2 = (0,203 \text{ j} + 0,12 \text{ k}) \text{ m}$$

$$\sum M_0 = 0 \quad M_{01} + M_{02} = 0 \quad \therefore$$

$$\begin{cases} 40,432 \cdot \sin \theta = 0 \\ 40,432 \cdot \cos \theta = 20,276 \end{cases}$$

$$\underline{\theta = 60^\circ}$$

$$b) \vec{F} = (66,5 \text{ i} - 115,18 \text{ j}) \text{ N}$$

$$M_0 = 40,432 \sin 60 \cdot i \text{ Nm} = \underline{\underline{35,02 \text{ Nm}}}$$

4.2)



$$\sum M = 0$$

$$-P \sin 30 \cdot d_1 + P \cos 30 \cdot d_2 + P d_3 = 0$$

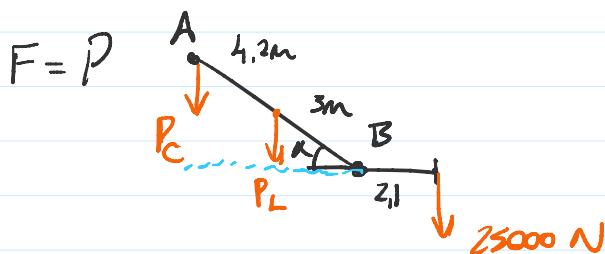
$$-450 \cdot 0,866 + 779,4 \cdot 0,25 + 0,48 P = 0$$

$$\underline{\underline{P = 117 \text{ N}}}$$

$$P + N = 900$$

$$\begin{aligned} N &= 900 - 117 \\ N &= \underline{\underline{783 \text{ N}}} \end{aligned}$$

4.6)



$$\begin{aligned} P_C &= 3000 \text{ N} \\ P_L &= 1250 \text{ N} \\ \sum M = 0 \end{aligned}$$

$$7,2 \cos \alpha \cdot 15k + 3 \cos \alpha \cdot P_L - 25000 \cdot z_1 = 0$$

$$7,2 \cdot \cos \alpha \cdot 15k + 3 \cdot \cos \alpha \cdot 1250 - 52500 = 0$$

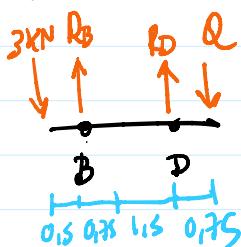
$$108000 \cos \alpha + 3750 \cos \alpha = 52500$$

$$\begin{aligned} 111750 \cos \alpha &= 52500 \\ \cos \alpha &= 0,469 \\ \alpha &= \underline{\underline{61,9^\circ}} \end{aligned}$$

LVRAR LIMA

$$x = 0,1,7$$

4.8)



G

$\text{EMB}:$

$$+3\text{kN} \cdot 0,75 + R_D \cdot 1,25 - Q \cdot 3 = 0 \\ 1,5k + 1,25R_D - 3Q = 0$$

$\text{EMD}:$

$$R_D = 0$$

$$-3Q + 1,5 = 0$$

$$2,75 \cdot 3\text{kN} - R_B \cdot 1,25 - Q \cdot 0,75 = 0 \\ 8,25 - R_B \cdot 1,25 - 0,75 Q = 0$$

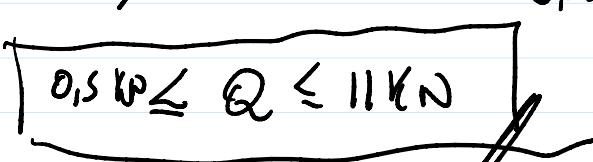
Werksspannung

$$Q = \frac{1,5}{3} = 0,5 \text{ kN}$$

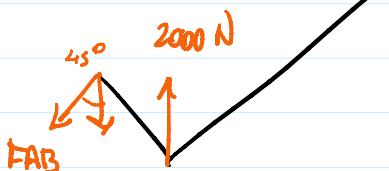
$$R_B = 0$$

$$8,25 - 0,75Q = 0$$

$$Q = 11 \text{ kN}$$



4.14)



$$F_{AB} \cdot \frac{\sqrt{2}}{2} \cdot 0,25 - 2000 \cdot 0,15 = 0$$

$$0,1768 F_{AB} = 300$$

$$\underline{F_{AB} = 1690,8 \text{ N}}$$

$$4.22) (0,2 \cdot \cos 30 i + 0,2 \cdot \sin 30 j) = \vec{r}$$

$$\begin{cases} \vec{r} \times \vec{R}_B + 2\vec{r} \times \vec{R}_C = -3r \times (-600j) = 311,77 \\ -\vec{r} \times \vec{R}_A + \vec{r} \times \vec{R}_C = -2\vec{r} \times (-600j) = 207,09 \\ -2\vec{r} \times \vec{R}_A - \vec{r} \times \vec{R}_B = -\vec{r} \times (-600j) = 103,42 \end{cases}$$

$$\rightarrow \begin{cases} 0,2R_B + 0,4R_C = 311,77 \\ -0,2R_A + 0,2R_C = 207,81 \\ -0,4R_A - 0,2R_B = 103,92 \end{cases}$$

Wear Lina

4.46)  $\vec{P} = (P_{\cos x_i}; P_{\sin x_j})$

$$\Rightarrow (-\vec{a}_i + \vec{a}_j) \times \vec{P} = (-\vec{a}_i) \times \vec{R}_A \Rightarrow -a \cdot P_{\sin x_i} (+ a P_{\cos x_i} - a R_A)$$

$$- (\vec{a}_j) \times \vec{P} = (\vec{a}_j) \times (\vec{R}_B) \Rightarrow -a P_{\cos x_j} = a R_B y$$

a)  $x = 0^\circ$

$$P(\cos x + \sin x) = R_A y \quad P_{\cos x} = R_B y$$

$R_A y = P$

$R_B y = P$

b)  $x = 45^\circ$

$$P(\cos x + \sin x) = R_A y$$

$R_A y = P \sqrt{2}$

$$-P_{\cos x} = R_B y$$

$R_B y = -P \frac{\sqrt{2}}{2}$