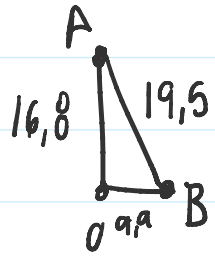
Lista 2

segunda-feira, 2 de novembro de 2020 15:50

Luiz Lima

2.58)



$|AB| = 19500\,N$

$19,5^2 = 16,8^2 + OB^2$

$OB = 9,9\,m$

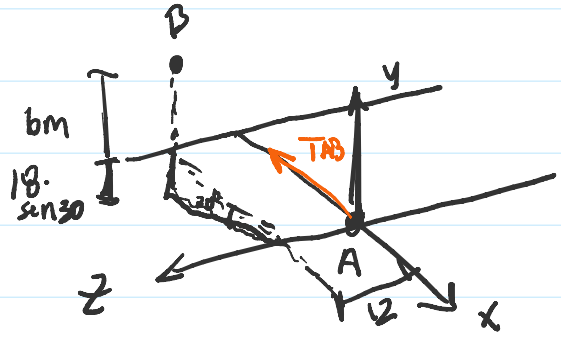
a) $19500\,N - 19,5\,m \quad \therefore \quad |AO| = 16800\,N$ ↓ (eixo vertical)

$|AO| - 16,8$

$|OB| = 9900\,N$ ← (eixo horizontal)

b) $\theta x = 0^\circ \quad \theta y = 90^\circ \quad \theta z = 110^\circ$

2.64)



$T_{AB} = 10\,kN$

$A = (4;0;0)$

$B = (-15,6;\ 15;\ 12)$

$\overrightarrow{AB} = (-15,6;\ 15;\ 12)$

$\vec{\lambda} = \dfrac{\overrightarrow{AB}}{24,746}$

$\lambda = -0,630\,\hat{i} + 0,606\,\hat{j} + 0,485\,\hat{k}$

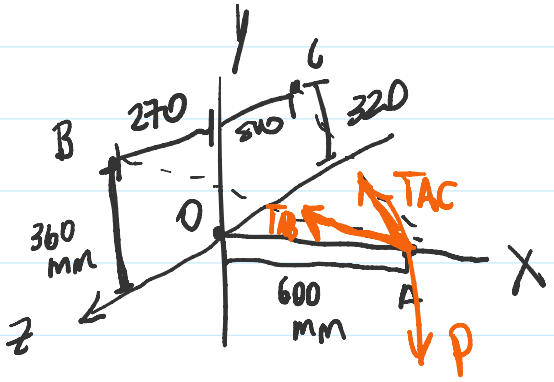
$\vec{T}_{AB} = T_{AB} \cdot \vec{\lambda} \Rightarrow$

$T_{ABx} = -6,3\,kN$

$T_{ABy} = 6,1\,kN$

$T_{ABz} = 4,9\,kN$

2.72)



Wras Lima

$T_{AB} = 850\ N$

Res x ∴ $\Sigma R_y = 0$

$\Sigma R_z = 0$

$A(0,6; 0; 0)$

$B(0; 0,36; 0,27)$

$C(0; 0,32; -0,51)$

$\vec{T_{AB}} = |T_{AB}| \cdot \vec{\lambda_{AB}}$

$\vec{T_{AC}} = |T_{AC}| \cdot \vec{\lambda_{AC}}$

$\vec{P}\ (0; -P_y; 0)$

$\vec{AB}\ (-0,6; 0,36; 0,27)$

$\vec{AC}\ (-0,6; 0,32; -0,51)$

$\vec{T_{AB}} = 850 \cdot (-0,8; 0,48; 0,36)$

$\vec{T_{AB}} = -680\,i; 408\,j; 306\,k\ [N]$

$\vec{T_{AC}} = |T_{AC}| \cdot (-0,70; 0,38; -0,6) = -357\,i; 193,8\,j; -306\,k\ [N]$

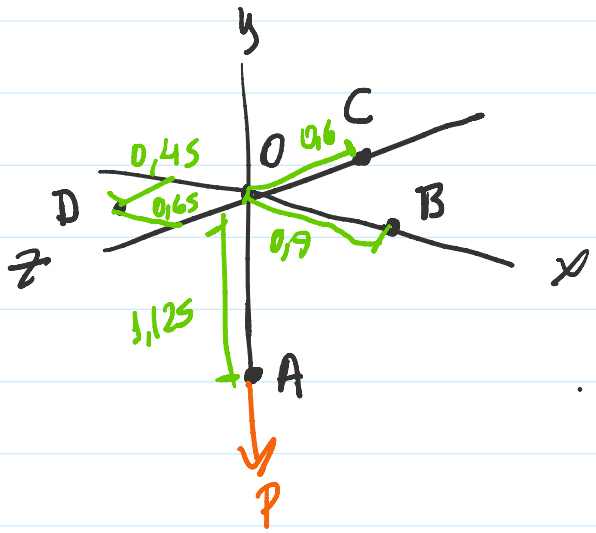
$\Sigma R_z = 0 \qquad 306 - 0,6 \cdot T_{AC} = 0 \qquad |T_{AC}| = 510\ N$

$306 = 0,6\,T_{AC}$

$\Sigma R_y = 0 \qquad 408 + 193,8 - P_y = 0$

$P_y = 601,8\ N$

2.74)



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$|T_{AD}| = 4620\ N$

$A(0; -1,125; 0)$

$B(0,7; 0; 0)$

$C(0; 0; -0,6)$

$D(-0,65; 0; 0,45)$

$\Sigma F = 0$

$\vec{AB}\ (0,7; +1,125; 0)$

$\vec{AC}\ (0; +1,125; -0,6)$

$\vec{AD}\ (-0,65; +1,125; 0,45)$

$\vec{T_{AB}} = |T_{AB}| \cdot (0,53; 0,85; 0)$

$\vec{T_{AC}} = |T_{AC}| \cdot (0; 0,89; -0,47)$

$\vec{T_{AD}} = 4620 \cdot (-0,47; 0,82; 0,33) = (-2171,4; 3788,4; 1524,6)$

$\vec{P} = (0; -P_y; 0)$

$\Sigma x = 0$

$0,53 \cdot T_{AB} - 2171,4 = 0$

$0,53 \cdot T_{AB} = 2171,4$

$|T_{AB}| = 4097\ N$

$\Sigma z = 0$

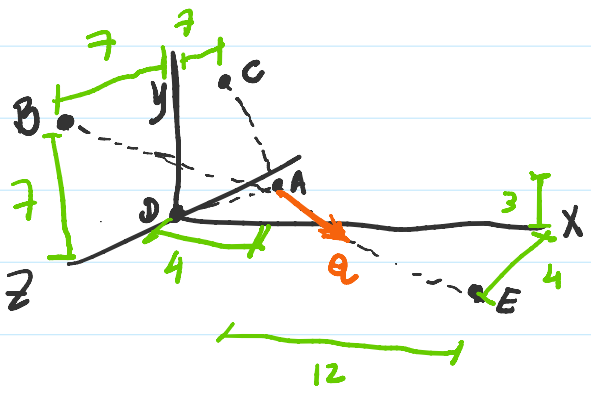
$-0,47 \cdot T_{AC} + 1524,6 = 0$

$|T_{AC}| = 3243\ N$

$\Sigma F_y = 0$ $\quad 0{,}85 \cdot 4097 + 0{,}89 \cdot 3243 + 3788{,}4 - P_y = 0$

$P_y = 10157\ N$ ✓ Mais Uma

1.80)



$|Q| = 7{,}28\ kN$

$A(4; 3; 0)$

$B(0; 7; 7)$

$C(0; 7; -7)$

$D(0; 0; 0)$

$E(16; 0; 4)$

$\vec{Q} = |Q| \cdot \lambda_{\vec{AE}}$

$\vec{Q} = 7{,}28 \cdot \left(\frac{12}{13}; \frac{-3}{13}; \frac{4}{13}\right)$

$\vec{AB}\ (-4; 4; 7)$

$\vec{AC}\ (-4; 4; -7)$

$\vec{AD}\ (-4; -3; 0)$

$\vec{AE}\ (12; -3; 4)$

$T_{AB} = |T_{AB}| \left(-\frac{4}{9}; \frac{4}{9}; \frac{7}{9}\right)$

$\lambda_{\vec{AB}} \left(-\frac{4}{9}; \frac{4}{9}; \frac{7}{9}\right)$

$T_{AC} = |T_{AC}| \left(-\frac{4}{9}; \frac{4}{9}; \frac{-7}{9}\right)$

$\lambda_{\vec{AC}} \left(-\frac{4}{9}; \frac{4}{9}; -\frac{7}{9}\right)$

$T_{AD} = |T_{AD}| \cdot \left(-\frac{4}{5}, \frac{3}{5}, 0\right)$

$\lambda_{\vec{AD}} \left(-\frac{4}{5}, \frac{3}{5}, 0\right)$

$\lambda_{\vec{AE}} \left(\frac{12}{13}; \frac{-3}{13}; \frac{4}{13}\right)$

$R_x = 6{,}72 - \frac{4}{9} T_{AB} - \frac{4}{9} T_{AC} - \frac{4}{5} T_{AD} = 0$

$R_y = -1{,}68 + \frac{4}{9} T_{AB} + \frac{4}{9} T_{AC} - \frac{3}{5} T_{AD} = 0$

$R_z = 1{,}24 + \frac{7}{9} T_{AB} - \frac{7}{9} T_{AC} = 0$

$\therefore T_{AB} = 2{,}8\ kN$

$$R_z = 224 + \frac{7}{9}T_{AB} - \frac{7}{9}T_{AC} = 0$$

$\therefore$ $T_{AB} = 2,88\,kN$
$T_{AC} = 5,76\,kN$
$T_{AD} = 3,60\,kN$

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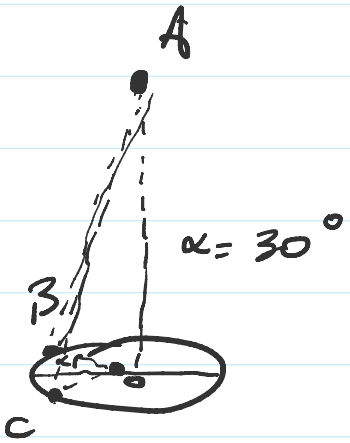
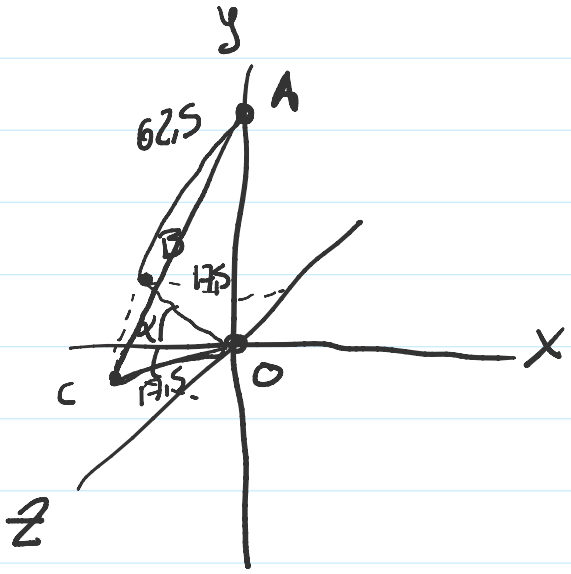
2.82)



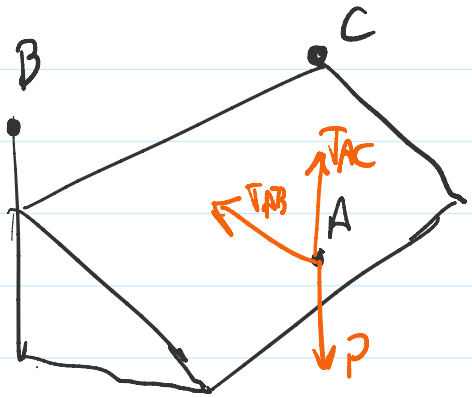


A (0; 60; 0)
B (−17,5 · cos 30; 0; −17,5 · sen 30)
C (−17,5 · cos 30; 0; 17,5 · sen 30)
D (17,5; 0; 0)

$T_{AB} = |T_{AB}| \cdot \lambda_{AB}$
$T_{AC} = |T_{AC}| \cdot \lambda_{AC}$
$T_{AD} = |T_{AD}| \cdot \lambda_{AD}$

$T_{AB} = T_{AC} = 16,57\,N$
$T_{DA} = 28,1\,N$

2.84)



A = (9; −4,8; 3,6)
B = (0; 2,4; 13,2)
C = (0; 1,20; 0)

$\overrightarrow{AB} = (-9; 7,2; 9,6)$
$\overrightarrow{AC} = (-9; 6; -3,6)$

$\vec{AC} = (-9; 6; -3,6)$

$\vec{T_{AB}} = |T_{AB}| \cdot (-0,6i + 0,48j + 0,64k)$

$\vec{T_{AC}} = |T_{AC}| \cdot (-0,789i + 0,526j - 0,316k)$

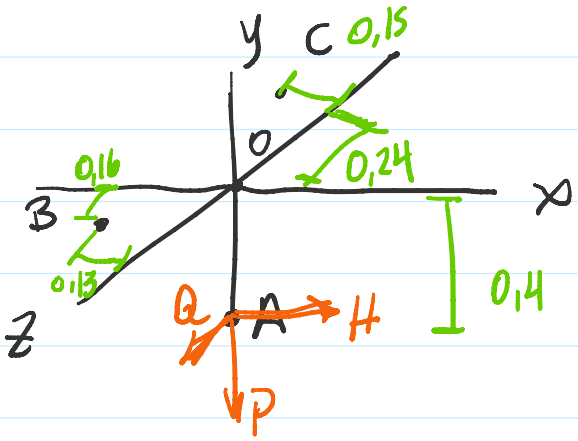
$\Sigma F_x = 0 \qquad -0,6T_{AB} - 0,789T_{AC} + 0,471N = 0$

$\Sigma F_y = 0 \qquad 0,48T_{AB} + 0,526T_{AC} + 0,82N - 882,9 = 0$

$\Sigma F_z = 0,64T_{AB} = 0,316T_{AC}$ Lucas Lima

$T_{AB} = 186\,N$ ↙ $\qquad T_{AC} = 315,6\,N$ ↘

2.88)



$T_{AB} = T_{AC}$

A(0; 0,4; 0)
B(-0,13; 0; 0,16)
C(-0,15; 0; -0,24)

$\vec{AB}$ (-0,13; -0,4; 0,16)
$\vec{AC}$ (-0,15; -0,4; -0,24)

$T_{AB} = |T_{AB}| \cdot (-0,28i - 0,88j + 0,35k)$

$T_{AC} = |T_{AC}| \cdot (-0{,}3\,i - 0{,}81\,j - 0{,}49\,k)$

$H = H_X$

$Q = Q_Z$

$P = 376\,N$

$\Sigma F_y = 0 \qquad T_{AB} = T_{AC}$

$-0{,}88\,T_{AB} - 0{,}81 \cdot T_{AC} + 376 = 0$

$-1{,}69\,T_{AB} = -376$

$T_{AB} = T_{AC} = +222{,}4\,N$

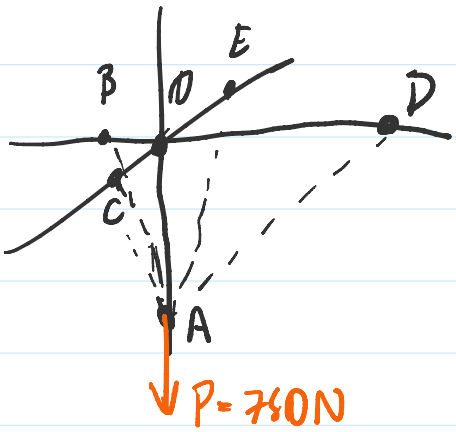
$623 + 66{,}72 + H_X = 0$

$H_X = +129{,}02\,N$

$-77{,}8 + 108{,}9 + Q_Z = 0$

$Q_Z = +31{,}3\,N$

2.90)



A (0; 1,2; 0)
B (-0,35; 0; 0)
C (0; 0; 0,5)
D (1,6; 0; 0)
E (0; 0; -0,9)

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$T_{AB} = |T_{AB}|(-0{,}28\,i + 0{,}96\,j)$

$T_{AC} = T_{AC}(0{,}12\,j + 0{,}324\,k)$

$T_{AD} = T_{AD}(0{,}8\,i + 0{,}6\,j)$

$\vec{AB}\ (-0{,}35; 1{,}2; 0)$
$\vec{AC}\ (0; 1{,}2; 0{,}5)$
$\vec{AD}\ (1{,}6; 1{,}2; 0)$
$\vec{AE}\ (0; 1{,}2; 0{,}9)$

$T_{AB} = T_{AC}$

Resolvendo o sistema

$T_{AE} = T_{AE}(0,8j + 0,6k)$

Resolvendo o sistema

$T_{AB} = T_{AC} = 438\,N$

$T_{AE} = 280,9\,N$

$T_{AD} = 153\,N$

2.96) a) $\sum F_x = T\cos 30 + T\cos x - P = 0$

$$\frac{2T\sqrt{3}}{2} = 1715$$

$$T = 990\,N$$

b) $\sum F_x = 2T\cos\theta = 1716 \cdot 75$

$T = 975\,N$

$\sin\theta = 0,47$

$\cos\theta = 0,88$

3.2) $\vec{r} = 0,2 \cdot \sin 65\,j + 0,2 \cdot \cos 65\,i$

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$|r| \simeq 0,2$

$M = r \cdot F \sin\theta$

$\theta \simeq 48,7°$

$\alpha = 16,3°$

3.4) $P = 450\,N$

$d_{AB} = 260$

$\alpha = 30°$

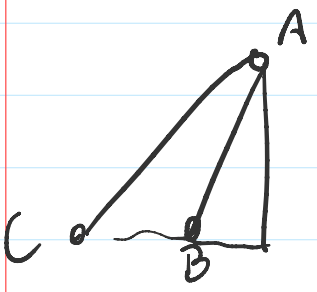
$M_{PB} = |d_{AB}| \cdot |F| \cdot \sin\theta$

$MP_B = 117000\,N/mm \rightarrow 117\,N/m$

$\alpha = 30°$ $MP_B = 117000 N/mm \rightarrow 117 N/m$

3.10)

$\vec{A} = (0; 0,762)$
$\vec{B} = (0,406; 0)$



$M_{AB} = 420 N$ $T_{AB} \cdot 0,863 = 420$

$M_{AB} = T_{AB} \cdot AB$ $T_{AB} = 486,44 N$

3.12)

$\vec{d} = (x - 0x, y - 0y)$

$|\vec{d}| = \sqrt{(x-0x)^2 + (y-0y)^2}$

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3.14)

a) $M = r \times F$

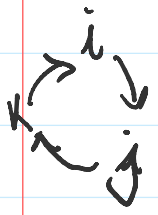
$$\begin{vmatrix} i & j & k \\ 2 & 3 & -4 \\ 4 & -3 & 5 \end{vmatrix} \begin{matrix} i & j \\ 2 & 3 \\ 4 & -3 \end{matrix}$$

$15i - 16j - 6k - 10j - 12i - 12k$

$$\vec{M} = (3i - 26j - 18k)\ \text{N·m}$$

b) $M = (-8i + 6j - 10k) \times (4i - 3j + 5k) = 0$

$+24k + 40j - 24k + 30i - 40j - 30i$



c) $M = (8i - 6j + 5k) \times (4i - 3j + 5k) =$

$-24k - 40j + 24k - 30i + 20j + 15i$

$(-15i - 20j)\ \text{N·m}$

3.16) Lucas Lima

$F_y = -F\cos\theta_y = -200 \cdot \cos 30 = -173{,}21\ N$

$F_z = F\cos\theta = 100\ N$

$F_x = 0$ $\qquad \vec{F} = (0; -173{,}21; 100)\ N$

$O = (0;0;0)$

$A = (0; -0{,}09; 0)$ $\qquad \vec{AC} = (0{,}06; 0{,}075; 0)$

A - (0; -0,05 ; 0)

C = (0,06; 0,025; 0)

$\overrightarrow{AC}$ = (0,06 ; 0,075 ; 0)

M = r x F

(0,06 ; 0,075 ; 0) x (0 ; -173,21 ; 100)

-10,4K - 60j + 7,5i

$\vec{M}$ = (7,5i ; -6 j ; -10,4K)

3.18)

$\vec{T}_{AD} = T_{AD} \lambda_{AD}$

$\vec{T}_{AB} = T_{AB} \cdot \lambda_{AB}$

$\vec{T}_{AD}$ = (106,4 ; -137,7 ; -53,2) N

$\vec{T}_{AB}$ = (0 ; -182 ; 0) N

$\vec{r}_{CA}$ = (0 ; 189 ; 0,73)

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$T_{AB} = T_{AD} = 182N$

$\vec{R} = T_{AD} + T_{AB} + T_{AB}$

$\vec{R}$ = (106,4 ; -501,7 ; -53,2) N

$M = \vec{r}_{CA} \times \vec{R}$

M = (265,7 ; 77,7 j - 201,1) N.m