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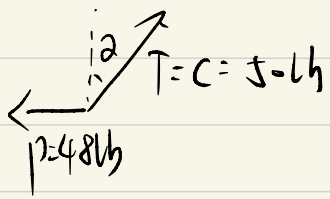
Test 1

1. for A:



$5^0 \sin 2 = 48 \Rightarrow \sin 2 = \frac{24}{25}$

$x = 20 \tan 2 = 20 \times \frac{7}{24} = 5.83$ in

2. (a) $\vec{M} = \vec{r} \times \vec{F}$

$= (2\vec{i} + 3\vec{j} - 4\vec{k}) \times (4\vec{i} - 3\vec{j} + 5\vec{k})$

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

$= (15 - 12)\vec{i} - (10 + 16)\vec{j} + (-6 - 12)\vec{k}$

$= 3\vec{i} - 26\vec{j} - 18\vec{k}$

(b) $\vec{M} = \vec{r} \times \vec{F}$

$= \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ -8 & 6 & -10 \\ 4 & -3 & 5 \end{vmatrix}$

$= (30 - 30)\vec{i} - (-40 + 40)\vec{j} + (24 - 24)\vec{k}$

$= 0$

(c) $\vec{M} = \vec{r} \times \vec{F}$

$$= \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 8 & -6 & 5 \\ 4 & -3 & 5 \end{vmatrix}$$

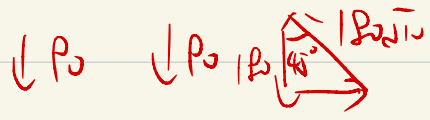
$$= (-30 + 15)\vec{i} - (40 - 20)\vec{j} + (-24 + 24)\vec{k}$$

$$= -15\vec{i} - 20\vec{j}$$

3. (a) $\sum M_A = -(P_0 \cdot 1m + P_0 \cdot 2m) + T_{BD} \cdot (150 \times \frac{1}{\sqrt{5}}) = 0$

$$\Rightarrow T_{BD} = \frac{P_0 \times 3m \times \sqrt{5}}{150} = 180\sqrt{10} = 569.21\ N$$

(b)



for the whole: $A = P_0 + P_0 = 180\ N$

$$\vec{A} = 180\ N \rightarrow$$

4.

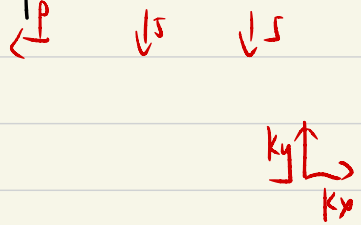
	V	$\bar{x}$	$\bar{x} \cdot V$
I	$-\pi r^2 h = -4521.6$	38	-171820.8
II	$38 \times 90 \times 10 = 34200$	19	649800
III	$\frac{1}{2}\pi R^2 h = 6280$	$38 + \frac{4R}{3\pi} = 46.49$	291857.2
IV	$9 \times 40 \times \frac{1}{2} \times 24 = 4320$	$10 + \frac{8}{3} \times \frac{9/2}{4\pi} = 13$	56160
V	$24 \times 10 \times 40 = 9600$	5	48000

$\Sigma \bar{x} \cdot V = 874096.4$

$\Sigma V = 49878.4$

$\bar{X} = \frac{\Sigma \bar{x} \cdot V}{\Sigma V} = 17.52$

5. for the whole:



$\Sigma F_{(x=0)} \Rightarrow K_x = 9$ kips $\rightarrow$

$\Sigma M_K = 0 \Rightarrow 15 \times 5 + 30 \times 5 + 8 \times P - 45B = 0$

$\Rightarrow B = 6.6$ kips $\uparrow$

$\Sigma F_y = 0 \Rightarrow k_y + B_y - 5 - 5 = 0$

$\Rightarrow k_y = 3.4$ kips $\uparrow$

$\Sigma M_{C=0} \Rightarrow 4 \times 9 - 7.5 \times 6.6 - 4 F_{AD} = 0 \Rightarrow F_{AD} = -3.375$ kips (C)

$\Sigma M_{D=0} \Rightarrow -15 \times 6.6 + 8 \times \frac{15}{17} F_{CE} = 0 \Rightarrow F_{CE} = 14.025$ kips (T)

$DG = AD = 3.375$ kips (C)

$\Sigma M_{I=0} \Rightarrow 4 \times 9 + 7.5 \times 3.4 - 4 F_{GJ} = 0 \Rightarrow F_{GJ} = 15.375$ kips (C)

$GJ = (15.375 - 3.375) \times \frac{5}{4} = 15$ kips (C)

6. $\Sigma F_x = 0 \Rightarrow F_{Bx} + F_A - 60 = 0$

$\Sigma F_y = 0 \Rightarrow F_{By} = 0$

$+\circlearrowleft \Sigma M_C = 0 \Rightarrow -8 \times 60 + 12 F_{Dy} = 0 \Rightarrow F_{Dy} = 40\,lb \uparrow$

$+\circlearrowleft \Sigma M_A = 0 \Rightarrow 16 \times 40 - 8 F_{Dx} - 8 F_{Cx} + 4 F_{Cy} - 8 F_{Bx} = 0$

for member BCD $\Sigma F_y = 0 \Rightarrow F_{Cy} + F_{By} = 0 \Rightarrow F_{Cy} = 40\,lb \downarrow$

$F_{Cx} = 40 \times 3 = 120\,lb \leftarrow$

$F_{Dx} = F_{Bx} + F_A = 60\,lb \leftarrow$

$+\circlearrowleft \Sigma M_B = 0 \Rightarrow 8 F_A - 4 \times 40 + 16 \times 40 = 0 \Rightarrow F_A = 60\,lb \leftarrow$

$F_B = 120\,lb \rightarrow$