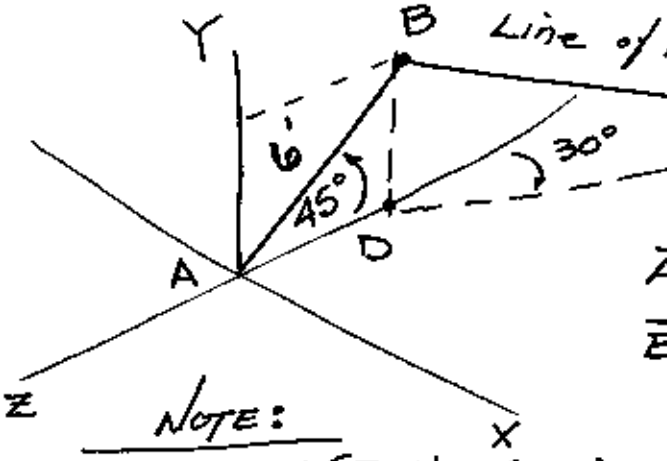
FISHING ROD

MECH 234
MILANO

HW 3.23



$\overline{AB}$ = 6 ft. = fishing rod

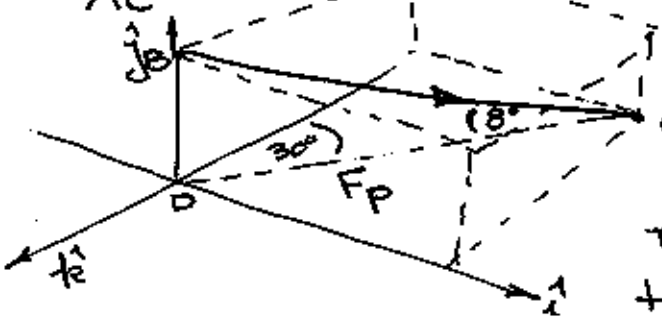
$\overline{BC}$ = fishing line = 6 lb. force
LINE of ACTION

NOTE:

45° in YZ ⊥ (VERT.)

30° in XZ ⊥ (HORIZ)

$\overline{AC}$ in XZ ⊥ (HORIZ)



∴ $\overrightarrow{BC}$ is in 3D space

$\vec{F} = \overrightarrow{BC} = +\hat{i} - \hat{j} - \hat{k}$

$F_y = 6^{lb} \sin 8° (-\hat{j}) = -.835\hat{j}$

need $F_p = 6^{lb} \cos 8° = 5.94^{lb}$.

to get $F_x = F_p \sin 30° = +2.97\hat{i}$

$F_z = F_p \cos 30° = -5.14\hat{k}$

$M_A = \vec{r} \times \vec{F} = \overrightarrow{AB} \times \overrightarrow{BC}$

and $\overrightarrow{AB} = 0\hat{i} + 6' \sin 45°\hat{j} - 6' \cos 45°\hat{k}$

$= 4.24\hat{j} - 4.24\hat{k}$

$$M_A = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 4.24 & -4.24 \\ 2.97 & -.835 & -5.14 \end{vmatrix} = \hat{i}\left[(4.24)(-5.14) - (-4.24)(-.835)\right] - \hat{j}\left[0 - (-4.24)(2.97)\right] + \hat{k}\left[0 - (4.24)(2.97)\right]$$

$M_A = \left(-25.35\hat{i} - 12.59\hat{j} - 12.59\hat{k}\right)$ ft.lb.

$= \sqrt{(25.35)^2 + (12.6)^2 + (12.6)^2} = 30.986$ ~ 31 ft.lb.

of Torque on pt. A

MECH 234 HW3.33
MILANO

same FISHING ROD
in HW 3.23

What's the ⊥ dist. to LINE of ACTION of FORCE along $\overline{BC}$

If $M = (d)(F)$ where $F \perp d$

then $d = \frac{|M|}{|F|} = \frac{30.986 \text{ ft. lb.}}{6 \text{ lb.}}$ from #3.23 force in fishing line.

$d = 5.164$ ft.
⊥ dist.