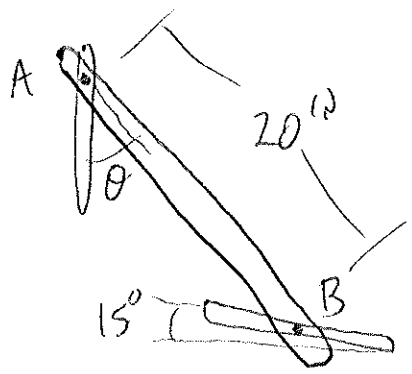
PROB. 15.38



$\theta = 40°$, PIN B MOVES LEFT AT $v_B = 6 \frac{IN}{SEC}$

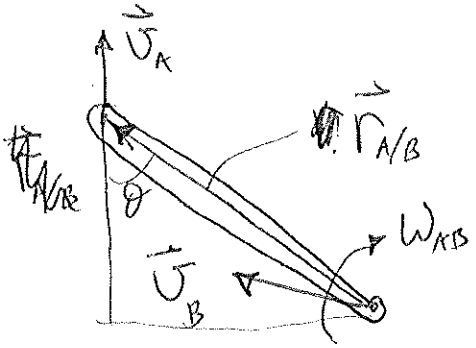
a) FIND ω_{AB}

$\vec{v}_A = \vec{v}_B + \vec{v}_{A/B} = \vec{v}_B + \omega \hat{k} \times \vec{r}_{A/B}$

$\vec{v}_B = (-6\cos 15°)\hat{i} + (6 \sin 15°)\hat{j}$

$\vec{v}_B = (-5.795)\hat{i} + (1.553)\hat{j} \frac{IN}{SEC}$

$\vec{v}_A = (v_A)\hat{j} \frac{IN}{SEC}$



FIND $\vec{r}_{A/B}$: $dx = -20 \cdot \sin 40° = -12.85$ IN

$dy = 20 \cos 40° = 15.32$ IN

$\vec{r}_{A/B} = (-12.85)\hat{i} + (15.32)\hat{j}$ IN

$$\omega \hat{k} \times \vec{r}_{A/B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & \omega_{AB} \\ -12.85 & 15.32 & 0 \end{vmatrix}$$

$= [(0)(0) - (\omega_{AB})(15.32)]\hat{i} - [(0)(0) - (\omega_{AB})(-12.85)]\hat{j}$

$= (-15.32\,\omega_{AB})\hat{i} + (-12.85\,\omega_{AB})\hat{j} \frac{IN}{SEC}$

$\vec{v}_A = \vec{v}_B + \omega \hat{k} \times \vec{r}_{A/B}$

$(v_A)\hat{j} = (-5.795)\hat{i} + (1.553)\hat{j} + (-15.32\omega_{AB})\hat{i} + (-12.85\omega_{AB})\hat{j}$

PROB. 15.38 CONT.

X-DIRECTION:

$$0 = -5.795 - 15.32\,\omega_{AB}$$

$$\omega_{AB} = -0.3782 \ \frac{\text{RAD}}{\text{SEC}} \ (\circlearrowleft)$$

Y-DIRECTION:

$$v_A = 1.553 - 12.85(-0.3782) = 6.413 \ \frac{\text{IN}}{\text{SEC}} \uparrow$$