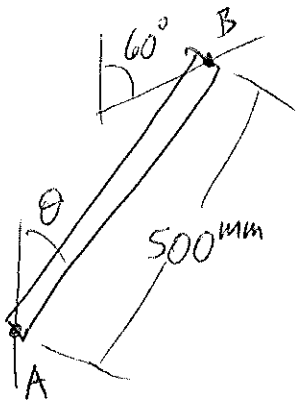


PROB. 15-41



COLLAR A MOVES UP AT $v_A = 1.2 \frac{m}{s}$

$$\theta = 25^\circ$$

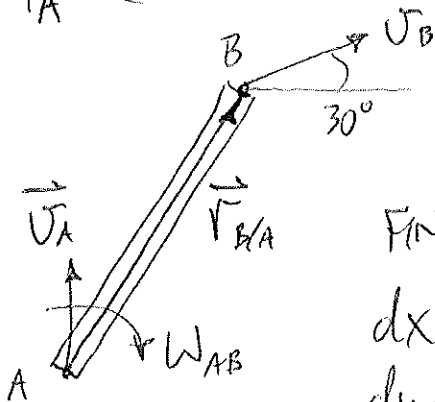
a) FIND ω_{AB}

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

$$\vec{v}_A = (1.2) \hat{j} \frac{m}{s}$$

$$\vec{v}_B = (v_B \cos 30^\circ) \hat{i} + (v_B \sin 30^\circ) \hat{j}$$

$$\vec{v}_B = (0.866 v_B) \hat{i} + (0.5 v_B) \hat{j} \frac{m}{s}$$



FIND $\vec{r}_{B/A}$:

$$dx = 0.5 \cdot \sin 25^\circ = 0.2113 \text{ m}$$

$$dy = 0.5 \cdot \cos 25^\circ = 0.4531 \text{ m}$$

$$\vec{r}_{B/A} = (0.2113) \hat{i} + (0.4531) \hat{j} \text{ m}$$

$$\omega \hat{k} \times \vec{r}_{B/A} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & \omega \\ 0.2113 & 0.4531 & 0 \end{vmatrix}$$

$$= [(0)(0) - (\omega)(0.4531)] \hat{i} - [(0)(0) - (\omega)(0.2113)] \hat{j}$$

$$= (-0.4531 \omega) \hat{i} + (0.2113 \omega) \hat{j} \frac{m}{s}$$

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

$$(0.866 v_B) \hat{i} + (0.5 v_B) \hat{j} = (1.2) \hat{j} + (-0.4531 \omega) \hat{i}$$

$$+ (0.2113 \omega) \hat{j}$$

PROB. 15-41 CONT.

X-DIRECTION:

$$0.866 \bar{V}_B = -0.4531 \text{ W} \Rightarrow \bar{V}_B = -0.5232 \text{ W}$$

Y-DIRECTION:

$$0.5 \bar{V}_B = 1.2 + 0.2113 \text{ W}$$

$$0.5(-0.5232 \text{ W}) = 1.2 + 0.2113 \text{ W}$$

$$W(0.2113 + 0.2616) = -1.2$$

$$W = -2.537 \frac{\text{RAD}}{\text{s}} \curvearrowright$$

$$\bar{V}_B = -0.5232(-2.537) = 1.328 \curvearrowright 30^\circ$$