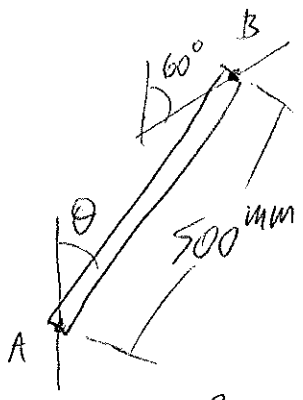
PROB. 15-42

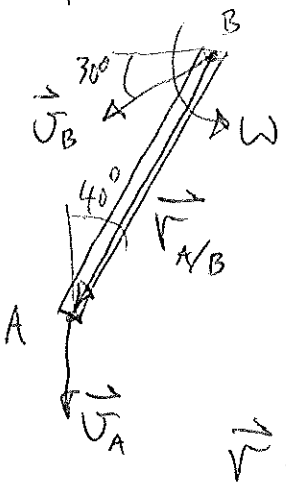


COLLAR B MOVES DOWN AND LEFT AT $v_B = 1.6 \frac{m}{s}$, $\theta = 40°$

a) FIND ω_{AB}

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

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



$$\vec{v}_B = (-1.6 \cdot \cos 30°)\hat{i} + (-1.6 \sin 30°)\hat{j}$$

$$\vec{v}_B = (-1.386)\hat{i} + (-0.8)\hat{j} \ \frac{m}{s}$$

FIND $\vec{r}_{A/B}$: $dx = -0.5 \cdot \sin 40° = -0.3214$ m

$dy = -0.5 \cdot \cos 40° = -0.3830$ m

$$\vec{r} = (-0.3214)\hat{i} + (-0.383)\hat{j} \ m$$

$$\omega\hat{k} \times \vec{r}_{A/B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & \omega \\ -0.3214 & -0.383 & 0 \end{vmatrix}$$

$$= [(0)(0) - (\omega)(-0.383)]\hat{i} - [(0)(0) - (\omega)(-0.3214)]\hat{j}$$

$$= (0.383\omega)\hat{i} + (-0.3214\omega)\hat{j} \ \frac{m}{s}$$

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

$$(-v_A)\hat{j} = (-1.386)\hat{i} + (-0.8)\hat{j} + (0.383\omega)\hat{i} + (-0.3214\omega)\hat{j}$$

PROB. 15-42 CONT.

X-DIRECTION:

$0 = -1.386 + 0.383\,\omega \Rightarrow \boxed{\omega = 3.618 \frac{RAD}{SEC}\ \curvearrowleft}$

Y-DIRECTION:

$-v_A = -0.8 - 0.3214\,(3.618)$

$\boxed{v_A = 1.963 \frac{m}{s}\ \downarrow}$