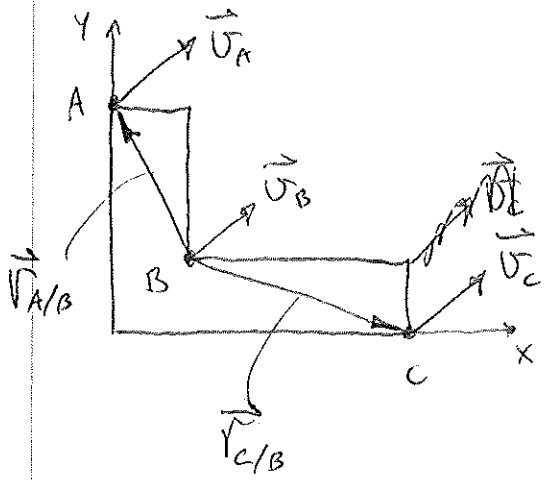
PROB, 15-44



$v_{A,x} = 12 \frac{IN}{SEC}$, $v_{Bx} = -4 \frac{IN}{SEC}$

$v_{Cy} = -24 \frac{IN}{SEC}$

a) FIND ω

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

$\vec{r}_{A/B} = (-2)\hat{i} + (4)\hat{j}$ IN

$$\omega \hat{k} \times \vec{r}_{A/B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & \omega \\ -2 & 4 & 0 \end{vmatrix}$$

$= [0 - (\omega)(4)]\hat{i} - [0 - (\omega)(-2)]\hat{j}$

$= (-4\omega)\hat{i} + (-2\omega)\hat{j}$

$(v_{Ax})\hat{i} + (v_{Ay})\hat{j} = (v_{Bx})\hat{i} + (v_{By})\hat{j} + (-4\omega)\hat{i} + (-2\omega)\hat{j}$

X-DIRECTION:

$v_{Ax} = v_{Bx} - 4\omega$

$12 = -4 - 4\omega \Rightarrow \boxed{\omega = -4.0 \frac{RAD}{s} \ (\curvearrowright)}$

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

$\vec{r}_{C/B} = (6)\hat{i} + (-2)\hat{j}$ IN

$$\omega \hat{k} \times \vec{r}_{C/B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & \omega \\ 6 & -2 & 0 \end{vmatrix}$$

PROB. 15-44 CONT.

$$\omega\hat{k} \times \vec{r}_{C/B} = [0-(\omega)(-2)]\hat{i} - [0-(\omega)(6)]\hat{j}$$

$$= (2\omega)\hat{i} + (6\omega)\hat{j} \ \frac{IN}{SEC}$$

$$(v_{C,x})\hat{i} + (v_{Cy})\hat{j} = (v_{Bx})\hat{i} + (v_{By})\hat{j} + (2\omega)\hat{i} + (6\omega)\hat{j}$$

Y-DIRECTION:

$$v_{Cy} = v_{By} + 6\omega$$

$$v_{By} = v_{Cy} - 6\omega = (-24) - 6(-4) = 0$$

$$v_B = \sqrt{v_{Bx}^2 + v_{By}^2} = 4 \ \frac{IN}{SEC} \leftarrow$$