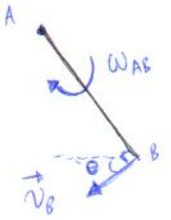
$\omega_{AB} = 360 \text{ rpm} \left(\frac{2\pi}{60}\right) = 37.7 \text{ rad/s}$

V2

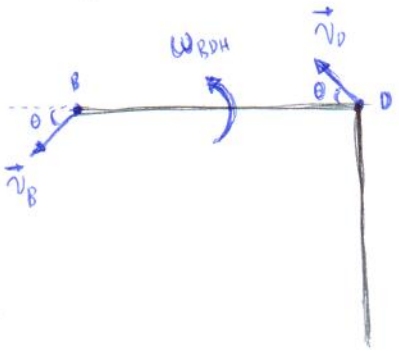
(3) ∘ Analizando AB para determinar $\vec{v}_B$



$$\vec{v}_B = \vec{\omega}_{AB} \times \vec{r}_{B/A} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & -37.7 \\ 3 & -4 & 0 \end{vmatrix} = (-150.8\,\hat{i} - 113.1\,\hat{j}) \text{ in/s}$$

$$\theta = \tan^{-1}\left(\frac{3}{4}\right) = 36.87°$$

∘ Analizando BDH:



∘ Ecuación de velocidad relativa: $\vec{v}_D = \vec{v}_B + \vec{\omega}_{BDH} \times \vec{r}_{D/B}$

∘ Vectores de velocidad y posición:

$$\vec{v}_D = (-v_D \cos\theta\,\hat{i} + v_D \operatorname{sen}\theta\,\hat{j}) = (-0.8\,v_D\,\hat{i} + 0.6\,v_D\,\hat{j}) \text{ in/s}$$

$$\vec{\omega}_{BDH} = (\omega_{BDH}\,\hat{k}) \text{ rad/s} \quad | \quad \vec{r}_{D/B} = (10\,\hat{i}) \text{ in}$$

∘ Sustituyendo en la ec. de velocidad:

$$(-0.8\,v_D\,\hat{i} + 0.6\,v_D\,\hat{j}) = (-150.8\,\hat{i} - 113.1\,\hat{j}) + \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & \omega_{BDH} \\ 10 & 0 & 0 \end{vmatrix}$$

$$\rightarrow (-0.8\,v_D\,\hat{i} + 0.6\,v_D\,\hat{j}) = (-150.8\,\hat{i} - 113.1\,\hat{j}) + (10\,\omega_{BDH}\,\hat{j})$$

∘ Escribiendo las ecs. escalares:

Comp. $\hat{i}$ → $-0.8\,v_D = -150.8$ ... (i)

Comp. $\hat{j}$ → $0.6\,v_D = -113.1 + 10\,\omega_{BDH}$ ... (ii)

De (i) → $v_D = \dfrac{-150.8}{-0.8} = 188.5 \text{ in/s}$

De (ii) → $\omega_{BDH} = \dfrac{0.6\,v_D + 113.1}{10} = 22.62 \text{ rad/s}$

Entonces:

$\omega_{BDH} = 22.62 \text{ rad/s}$ ↻

$\vec{v}_D = (-150.8\,\hat{i} + 113.1\,\hat{j}) \text{ in/s}$

O bien $\vec{v}_D = 188.5 \text{ in/s} \not\angle 36.87°$