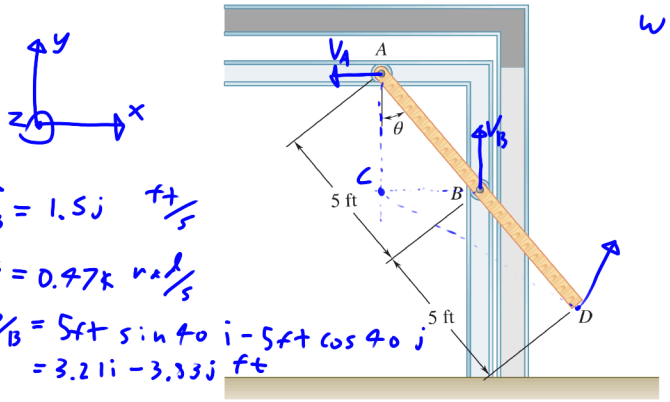
An overhead door is guided by wheels at A and B that roll in horizontal and vertical tracks. Knowing that when $\theta = 40°$ the velocity of wheel B is 1.5 ft/s upward, determine (a) the angular velocity of the door, (b) the velocity of end D of the door.



$\omega = \frac{V_B}{r_B} = \frac{1.5\ ft/s}{5ft \sin 40}$

$= 0.47\ rad/s$

$\vec{V}_B = 1.5j\ ft/s$

$\vec{\omega} = 0.47k\ rad/s$

$\vec{r}_{D/B} = 5ft \sin 40\, i - 5ft \cos 40\, j$

$= 3.21i - 3.83j\ ft$

$\vec{V}_D = \vec{V}_B + \vec{\omega} \times \vec{r}_{D/B}$

$= 1.5j + \begin{vmatrix} i & j & k \\ 0 & 0 & 0.47 \\ 3.21 & -3.83 & 0 \end{vmatrix}$

$= 1.5j + 0.47 \cdot 3.21j + 0.47 \cdot 3.83i$

$= 1.8i + 3j\ ft/s$