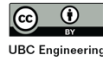
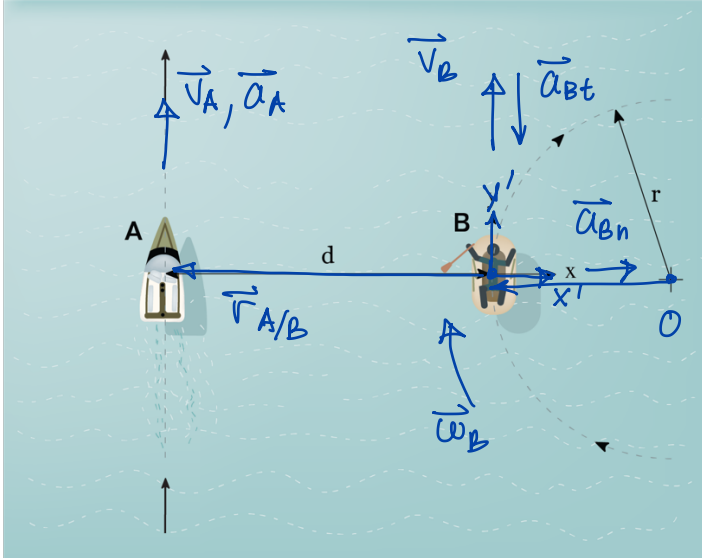


Boat A is travelling forward (in positive y) with a velocity of 25 m/s and an acceleration of 4 m/s². The person in dingy B is travelling in a circle (as they only have one oar). They have a forward (in positive y) velocity of 5 m/s and acceleration of -1 m/s² (as they have lost focus while watching boat A). The radius of dingy B's path is $r = 20$ m, and the distance between the vessels is $d = 10$ m.

Find the velocity and acceleration of boat A as seen by the occupants of dingy B.



Find $(\vec{v}_{A/B})_{rel}$ & $(\vec{a}_{A/B})_{rel}$

$$\vec{v}_B = \vec{v}_O + \vec{\omega}_B \times \vec{r}_{B/O}$$

$$v_B \hat{j} = -\omega_B \hat{k} \times (-r \hat{i})$$

$$v_B \hat{j} = \omega_B r \hat{j}$$

$$\Rightarrow \omega_B = \frac{v_B}{r} \quad \vec{\omega}_B =$$

$$\vec{a}_{Bt} = \vec{\alpha}_B \times \vec{r}_{B/O}$$

$$-a_{Bt} \hat{j} =$$

$$\vec{v}_A = \vec{v}_B + \vec{\omega}_B \times \vec{r}_{A/B} + (\vec{v}_{A/B})_{rel}$$

$$(\vec{v}_{A/B})_{rel} = \vec{v}_A - \vec{v}_B - \vec{\omega}_B \times \vec{r}_{A/B}$$

$$= 25 \text{ m/s } \hat{j} - 5 \text{ m/s } \hat{j} -$$

$$= 20 \text{ m/s } \hat{j} - 2.5 \text{ m/s } \hat{j}$$

$$\boxed{(\vec{v}_{A/B})_{rel} = 17.5 \text{ m/s } \hat{j}}$$

$$(-\hat{k}) \times (-10 \text{ m/s } \hat{i})$$

$$-10.625 \hat{i} + 5.5 \hat{j} \text{ m/s}^2$$