

20-P-KM-AF-022

CM Cylindrical Components: Advanced

Q: You relax on a floatie on the Okanagan Lake, suddenly, the Ogopogo pops up B m away travelling perpendicular to you at A m/s. You pull your phone out to track and film the Ogopogo, when $r = C$ m, what is the angular velocity at which you are turning for your phone?

A: $r = B \csc \theta$
 $\dot{r} = -B \csc \theta \cot \theta \dot{\theta}$
at $r = C$, $\theta = \sin^{-1}(B/C)$

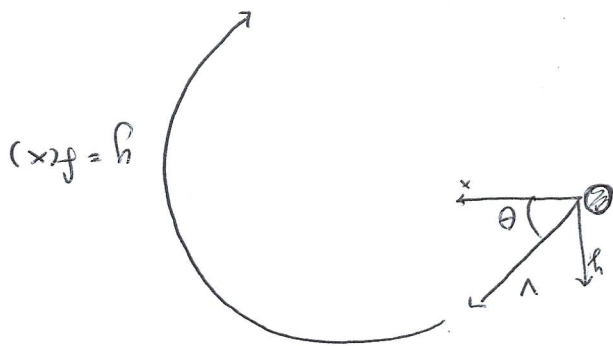
$$\dot{r} = -B \csc \theta \cot \theta \dot{\theta} \Rightarrow \dot{r}_1 = -B \csc \theta \cot \theta$$

$$v^2 = (\dot{r})^2 + (r\dot{\theta})^2$$

$$(\dot{\theta})^2 ((\dot{r}_1)^2 + r^2) = v^2$$

$$\dot{\theta} = \sqrt{\frac{v^2}{(\dot{r}_1)^2 + r^2}} = \sqrt{\frac{A^2}{(-B \csc \theta \cot \theta)^2 + (B \csc \theta)^2}}$$

sample diagram



20 - P - KM - AF - 021

