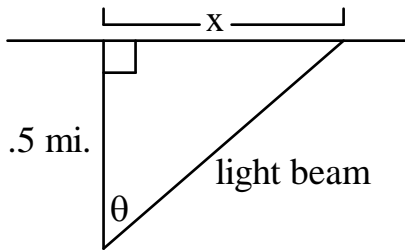


Calculus Worksheet #2 Unit 7 Selected Solutions

4. A light one-half mile off a straight shore rotates once every minute. How fast is the beam of light moving along the shore the instant it makes an angle of 60 degrees with the shore? (Express your final answer in feet per second.)



Given: $d\theta/dt = 2\pi$ radians per minute

Find dx/dt when $\theta = 30^\circ$

$$\tan \theta = 2x$$

$$(\sec^2 \theta) d\theta/dt = 2(dx/dt)$$

$$dx/dt = .5 (\sec^2 \theta) d\theta/dt$$

When $\theta = 30^\circ$, $\sec^2 \theta = 4/3$

$$\Rightarrow dx/dt = \frac{2\pi}{3} \text{ miles per minute} \approx \mathbf{184 \text{ ft. per sec.}}$$

The light beam is moving at about 184 feet per second.