

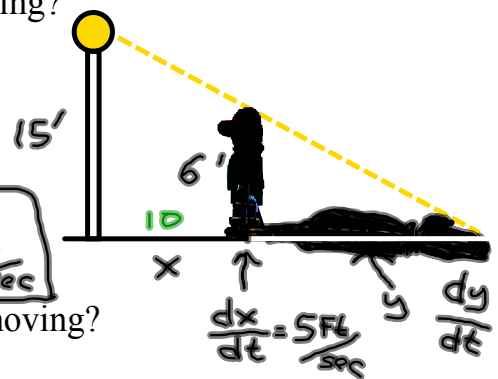
35) A man 6 ft tall walks at a rate of 5 ft/sec away from a light that is 15 ft above the ground. When he is 10 ft from the base of the light,

a) at what rate is the tip of his shadow moving?

distance of tip = $x + y$

rate of tip = $\frac{dx}{dt} + \frac{dy}{dt}$

$5 + \frac{10}{3} = \frac{25}{3} \frac{\text{ft}}{\text{sec}}$



b) at what rate is the length of his shadow moving?

Do First

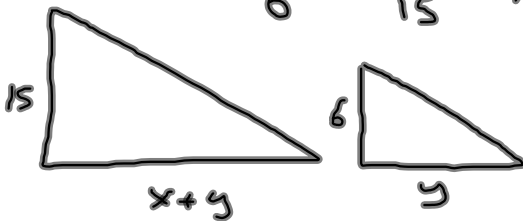
$\frac{y}{6} = \frac{x+y}{15} \Rightarrow 15y = 6x + 6y$

$9y = 6x$

$9 \frac{dy}{dt} = 6 \frac{dx}{dt}$

$3 \frac{dy}{dt} = 2(5)$

$\frac{dy}{dt} = \frac{10}{3} \frac{\text{ft}}{\text{sec}}$



37) The endpoints of a movable rod of length 1 m have coordinates $(x,0)$ and $(0,y)$. The position of the end on the x-axis is:

$$\frac{1}{4} = \frac{1}{2} \sin \frac{\pi}{6} t \quad x(t) = \frac{1}{2} \sin \frac{\pi t}{6}$$

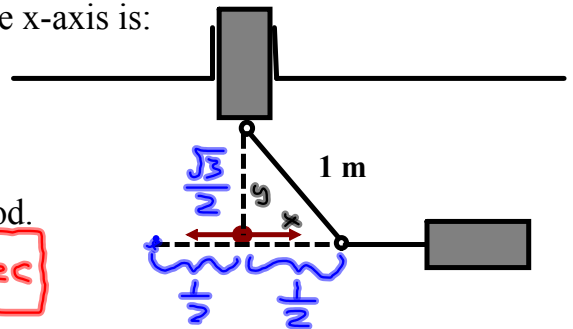
where t is time in seconds

$$\frac{1}{2} = \sin \left(\frac{\pi}{6} t \right)$$

a) Find the time of one complete cycle of the rod.

$$\frac{\pi}{6} = \frac{\pi}{6} t \quad \text{period} = 2\pi \div \frac{\pi}{6} = \boxed{12 \text{ sec}}$$

1.-t



b) What is the lowest point reached by the end of the rod on the y-axis?

$$\frac{\sqrt{3}}{2}$$

c) What is the speed of the y-axis endpoint when the x-axis endpoint is $(\frac{1}{4}, 0)$.

$$-\frac{\pi}{24\sqrt{3}} \frac{m}{sec}$$

$$x^2 + y^2 = 1 \quad \frac{1}{4}^2 + y^2 = 1$$

$$y^2 = \frac{15}{16} \quad y = \frac{\sqrt{15}}{4}$$

$$x(t) = \frac{1}{2} \sin \left(\frac{\pi}{6} t \right) \quad /sec$$

$$\frac{dx}{dt} = \frac{1}{2} \cos \left(\frac{\pi}{6} t \right) \cdot \frac{\pi}{6}$$

$$= \frac{\pi}{12} \cos \frac{\pi}{6} t \Big|_{1sec} = \frac{\pi}{12} \frac{\sqrt{3}}{2}$$

$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 0 \quad \frac{1}{4} \left(\frac{\pi\sqrt{3}}{24} \right) = - \left(\frac{\sqrt{15}}{4} \right) \frac{dy}{dt}$$