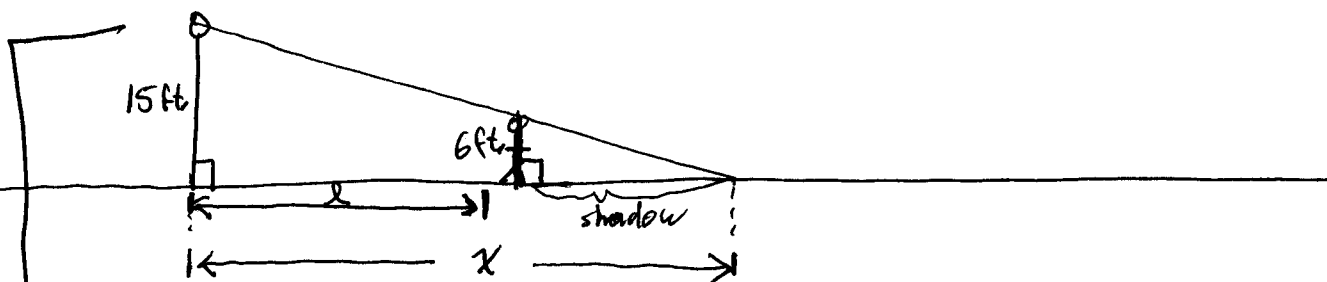


MAT 106
Quiz #9
September 23, 2004

Name: Kuey

You may not use your notes. Please show all of your work. An answer without justification will receive little credit.

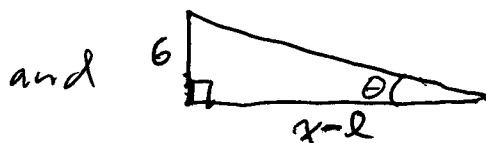
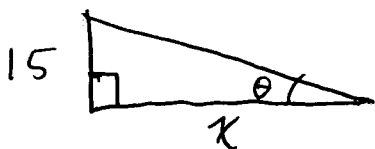
- (1) A street light is mounted at the top of a 15 ft. pole. A man 6 ft. tall walks away from the pole with a speed of 5 ft./sec. along a straight path. How fast is the tip of his shadow moving when he is 40 ft. from the pole?



We are given: $\frac{dl}{dt} = 5 \text{ ft/sec}$

We want $\left. \frac{dx}{dt} \right|_{l=40}$

We note that there are similar triangles



Thus,

$$\frac{x}{15} = \frac{x-l}{6}$$

$$\Rightarrow 6x = 15x - 15l$$

$$\Rightarrow 9x = 15l \Rightarrow x = \frac{15}{9} l$$

Differentiating we have

$$\frac{dx}{dt} = \frac{15}{9} \frac{dl}{dt} = \frac{75}{9} \text{ ft/s}$$

So, $\left. \frac{dx}{dt} \right|_{l=40} = \frac{75}{9} \text{ ft/s}$

- (2) The position function of Dr. James as he paces in front of the class from time $t = 0$ until time $t = 3$ is given by $s(t) = t^2 - 3t + 2$ ft.

a.) Find Dr. James's velocity as a function of time. When is his velocity positive, negative?

$$v(t) = s'(t) = 2t - 3 \text{ ft/s}$$

$$2t - 3 < 0$$

$$\Rightarrow t < \frac{3}{2}$$

$$2t - 3 > 0$$

$$\Rightarrow t > \frac{3}{2}$$

So the velocity is negative for $t \in [0, \frac{3}{2})$
and positive for $t \in (\frac{3}{2}, 3]$,

b.) What is Dr. James's acceleration?

~~1~~

$$\text{~~1~~ } a(t) = s''(t) = v'(t) = 2 \text{ ft/s}^2$$

c.) What is the total distance travelled by Dr. James as t goes from 0 to 3. Keep in mind that sometimes his velocity is negative and sometimes it is positive.

The total distance is given by

$$|s(\frac{3}{2}) - s(0)| + |s(3) - s(\frac{3}{2})|$$

$$= |(\frac{9}{4} - \frac{9}{2} + 2) - 2| + |2 - (\frac{9}{4} - \frac{9}{2} + 2)|$$

$$= \frac{9}{4} + \frac{9}{4} = \frac{9}{2} \text{ ft.}$$