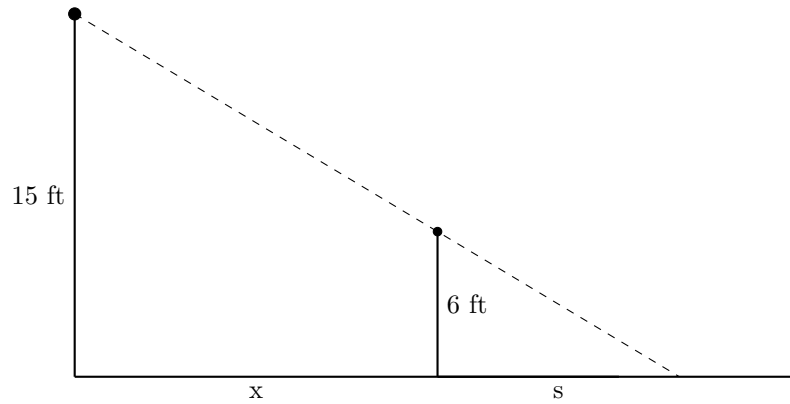


Question 4

Problem:

A 6-ft tall person walks away from a 15-ft tall streetlight at a rate of 3 ft/s.

- (a) How fast is the tip of the shadow moving when the person is 30 ft from the base of the light?
(b) At the same moment, how fast is the length of the shadow increasing?



Question 4 - Solution

Let: - $x(t)$ be the distance from the person to the light pole - $s(t)$ be the length of the shadow - The tip of the shadow is at a distance $x + s$ from the pole

Using similar triangles:

$$\frac{6}{s} = \frac{15}{x+s} \Rightarrow 6(x+s) = 15s \Rightarrow 6x + 6s = 15s \Rightarrow 6x = 9s \Rightarrow s = \frac{2}{3}x$$

Differentiate with respect to t :

$$\frac{ds}{dt} = \frac{2}{3} \frac{dx}{dt}$$

Given:

$$\frac{dx}{dt} = 3 \text{ ft/s} \Rightarrow \frac{ds}{dt} = \frac{2}{3}(3) = 2 \text{ ft/s}$$

Now, the tip of the shadow moves at:

$$\frac{d}{dt}(x+s) = \frac{dx}{dt} + \frac{ds}{dt} = 3 + 2 = \boxed{5 \text{ ft/s}}$$

Answers:

(a) The tip of the shadow is moving at $\boxed{5 \text{ ft/s}}$

(b) The shadow is lengthening at $\boxed{2 \text{ ft/s}}$