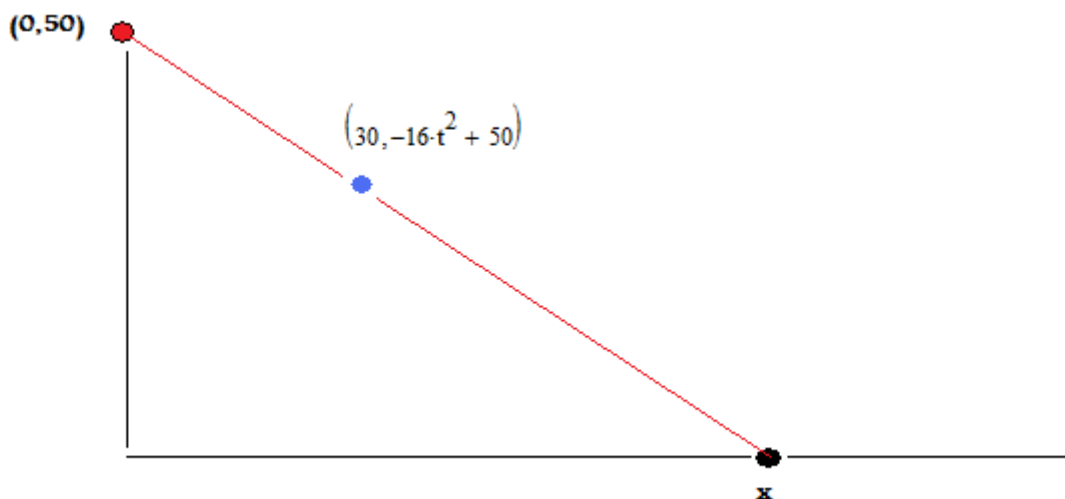


Suppose there is a light at the top of a pole 50 ft high. An object is 30 feet from the base of the light pole and is released from a height of also 50 ft. Find the rate at which the shadow is moving along the ground.

[See Animation Moving Shadow.](#)



The height of the object is  $s(t) = -16t^2 + 50$ .

The idea then is to compute the equation of the line through the points (0,50) and  $(30, -16t^2 + 50)$ .

Then we set  $y = 0$  to find the  $x$  intercept. Then we compute  $dx/dt$  to find the velocity the shadow is moving which is the same as the velocity of the  $x$  intercept along the  $x$  axis.

$$y = \frac{(-16t^2 + 50 - 50)}{30} \cdot (x - 30) + (-16t^2 + 50)$$

$$y = \frac{-16t^2}{30} \cdot (x - 30) + -16t^2 + 50$$

$$y = \frac{-16t^2}{30} \cdot x + 50 = \frac{-8t^2}{15} \cdot x + 50$$

The x intercept is then:

$$x = \frac{375}{4t^2}$$

$$\frac{dx}{dt} = \frac{-375}{2 \cdot t^3}$$

Consider various speeds at various times:

$$t := 1, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7 \quad v(t) := \frac{-375}{2 \cdot t^3}$$

t =

1
1.1
1.2
1.3
1.4
1.5
1.6
1.7

v(t) =

-187.5
-140.872
-108.507
-85.344
-68.331
-55.556
-45.776
-38.164

You may want to view the animation again.