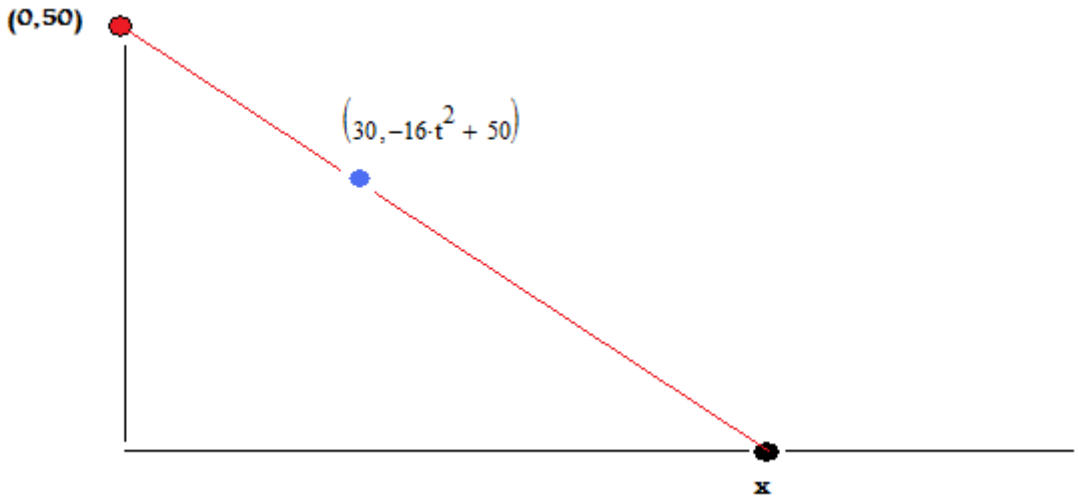
Suppose there is a light at the top of a pole 50 ft high. An object is 30 feet from the base of the light pole and is released from a height of also 50 ft. Find the rate at which the shadow is moving along the ground.

See Animation Moving Shadow.



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

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

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

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

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

The x intercept is then:

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

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

Consider various speeds at various times:

$t := 1, 1.1 .. 1.7$ $\qquad v(t) := \frac{-375}{2 \cdot t^3}$

t =	v(t) =
1	-187.5
1.1	-140.872
1.2	-108.507
1.3	-85.344
1.4	-68.331
1.5	-55.556
1.6	-45.776
1.7	-38.164

You may want to view the animation again.