

Math-2A

Lesson 5-8

Modeling with Quadratic Equations

- 1) Area problems
- 2) Projectile Motion Problems

Mathematical Modeling: representing a real-world phenomenon or quantity with an equation or inequality.

$$h(t) = -16t^2 + v_0t + h_0$$

If you drop a rock off of a cliff, what happens to the rock?

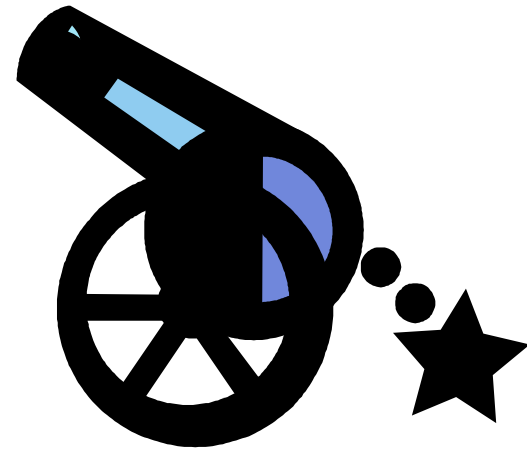
Does it remain stationary?

Which direction does it fall?

As it falls, does it speed up?

Real World

**What path does
the cannon ball take?**



Projectile Motion

A vertical time-distance problem in two dimensions.

Height as a function of time.

Height at time = 0
(initial height)

$$h(t) = -16t^2 + v_0t + h_0$$

Vertical component of acceleration (of Gravity) multiplied by time squared gives the change in vertical position due to gravity.

Vertical component of velocity (speed) multiplied by time gives the change in vertical position resulting from the initial velocity.

Projectile Motion Problem

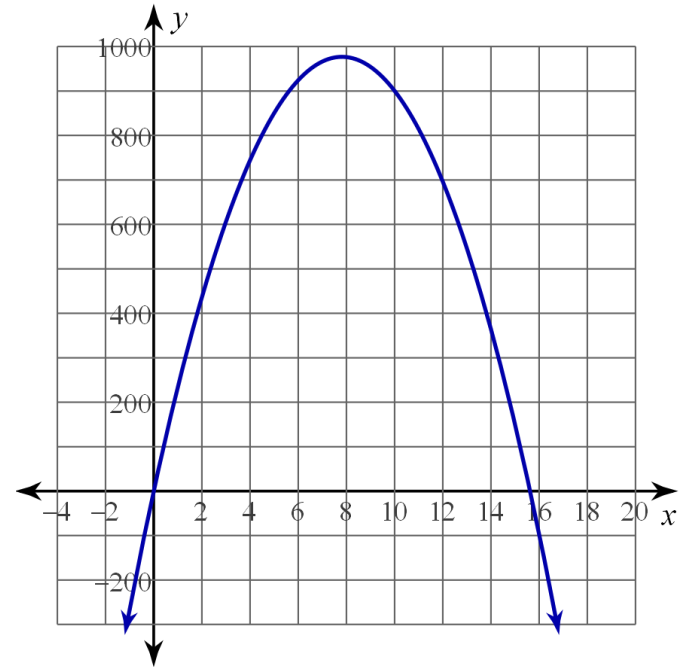
An object is launched vertically upward from the ground at an initial velocity of 250 ft per second.

a. When will the object be at its maximum height?

$$h(t) = -16t^2 + v_0t + s_0$$

$$h(t) = -16t^2 + 250t$$

Find the vertex using “technology”.



Projectile Motion Problem

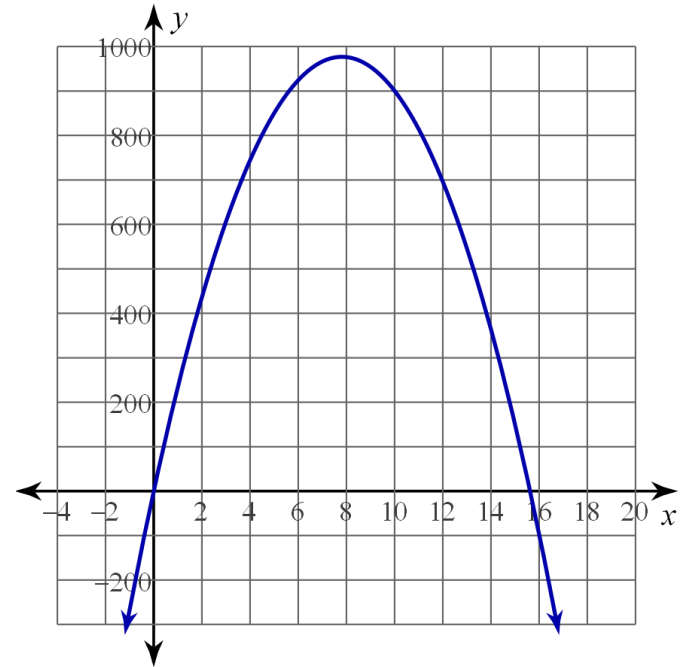
An object is launched vertically upward from the ground at an initial velocity of 250 ft per second.

b. When will the object fall back to the ground?

$$h(t) = -16t^2 + v_0t + s_0$$

$$h(t) = -16t^2 + 250t$$

Find the x-intercept using
“technology”.



Projectile Motion Problem

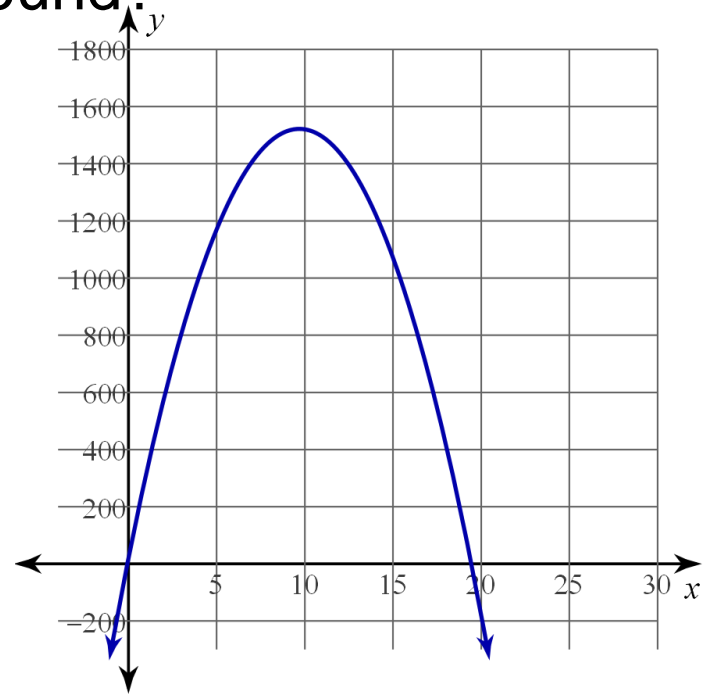
An object is launched vertically upward from the top of a 20 foot building at an initial velocity of 310 ft. per second.

- When will the object be at its maximum height?
- When will the object fall to the ground?

$$h(t) = -16t^2 + v_0t + s_0$$

$$h(t) = -16t^2 + 310t + 20$$

- Find the vertex.
- Find the x-intercept.



Projectile Motion Problem

An object is launched vertically upward from the ground at an initial velocity of 250 ft per second.

b. When will the object reach 500 feet?

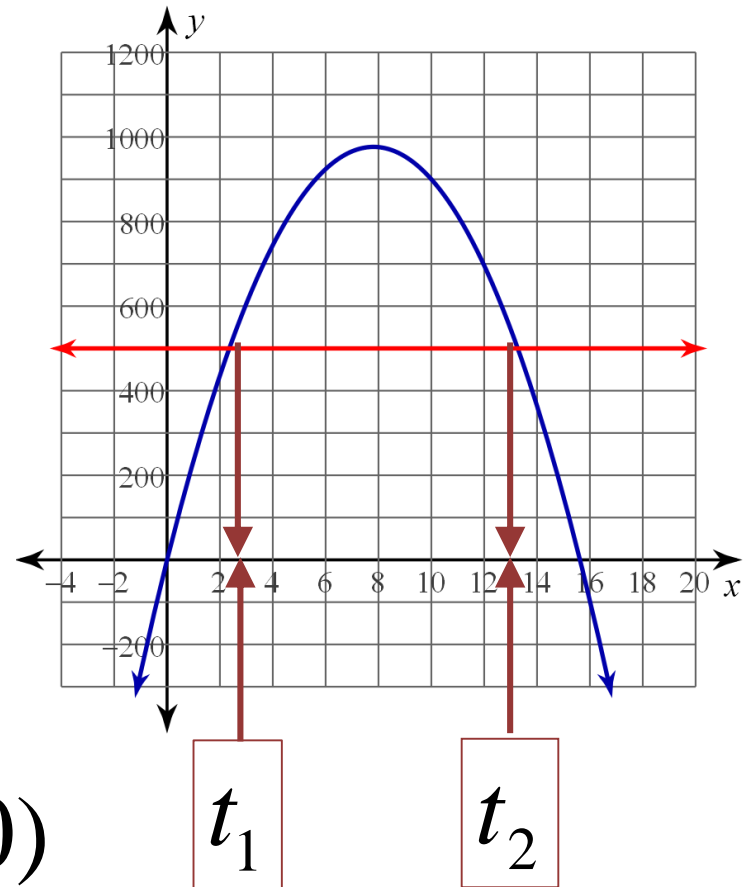
$$h(t) = -16t^2 + v_0t + s_0$$

$$h(t) = -16t^2 + 250t$$

$$h(t) = 500$$

Find the (time, height) pairs
→ points of intersection.

$$(t, h) = (t_1, 500), (t_2, 500)$$



Projectile Motion Problem

An object is launched vertically upward from the ground at an initial velocity of 450 ft per second.

b. When will the object reach 2500 feet?

$$h(t) = -16t^2 + v_0t + s_0$$

$$h(t) = -16t^2 + 450t$$

$$h(t) = 2500$$

Find the (time, height) pairs
→ points of intersection.

$$(t, h) = (t_1, 2500), (t_2, 2500)$$

