

Algebra 2
5.2 Quadratic Applications

Name: Key

Vertical Motion Equation: $h(t) = -16t^2 + v_0t + h_0$, where v_0 represents the initial velocity (positive for upward velocity and negative for downward velocity) of the object in feet/second and h_0 represents the initial height of the object in feet.
(This would change to $h(t) = -9.8t^2 + v_0t + h_0$ if the units were meters instead of feet.)

1. David threw a baseball up into the air with a velocity of 80 ft/s. The ball's initial height is negligible.
- a. Write an equation describing the height of the ball after time t .

$$y = -16t^2 + 80t$$

- b. When was the ball on the ground? You may use a calculator to solve.

"INTERSECT" $0 = -16t^2 + 80t$ (5, 0)

y_1 y_2

$$t = 5 \text{ sec}$$

- c. When was the ball at a height of 60 feet? You may use a calculator to solve.

$$60 = -16t^2 + 80t$$

y_1 y_2

$(.92, 60)$
 $(4.08, 60)$

$$t = .92 \text{ sec and } 4.08 \text{ sec}$$

- d. When was the ball at its maximum height? Show your calculation.

"VERTEX" $x = \frac{-b}{2a} = \frac{-80}{2(-16)} = 2.5$ $y = -16(2.5)^2 + 80(2.5)$
 $y = 100$

$$2.5 \text{ sec, } 100 \text{ feet}$$

- e. What is the maximum height the ball reached? Show your calculation and use your calculator to check.

2. Sam lives in an apartment building at a height of 50 meters. He tried to throw a ball up to his friend Johnny, 30 meters above. Johnny did not catch the ball and it ended up hitting the ground after 3.5 seconds.

- a. Find the initial velocity of the ball. Show your calculation. $0 = -16(3.5)^2 + v_0(3.5) + 50$

$$41.71 = v_0$$

- b. Write an equation describing the height of the rock after time t .

$$y = -16t^2 + 41.71t + 50$$

- c. When was the ball at its maximum? Show your calculation.

$$x = \frac{-41.71}{2(-16)} = 1.29 \text{ sec}$$

- d. At what height did the ball reach its maximum? Show your calculation and check with your calculator.

$$y = -16(1.29)^2 + 41.71(1.29) + 50$$

$$y = 76.79 \text{ ft}$$

- e. When did the ball return to a height of 50 meters? You may use your calculator to solve.

$$x = 2.59 \text{ sec}$$