

SM2 7.3: Applications of Quadratic Functions

Round all answers to the nearest tenth, unless the unit of measure is dollars, then round to the nearest cent.

- 1) A soccer ball is kicked from the ground and travels a parabolic path modeled by $h(t) = -5t^2 + 19.5t$, where $h(t)$ is the height of the soccer ball in meters above the ground t seconds after being kicked.

Assuming the ball lands on level ground, about how long is the ball in the air?

3.9 sec

- 2) A golf ball is shot from the ground using a practice cannon and travels a parabolic path modeled by $h(t) = -16t^2 + 150t$, where $h(t)$ is the height of the golf ball in meters above the ground after being shot.

Assuming the ball lands on level ground, about how long does it take the ball to hit the ground?

9.4 sec

- 3) The senior class is putting on a talent show to raise money for their senior trip. In the past, the profit from the talent show could be modeled by the function $P(t) = -16t^2 + 600t - 4000$, where t represents the ticket price in dollars.

- a. What is the reasonable domain for the function?

$[0, \infty)$ It wouldn't make sense to charge negative ticket prices

- b. For what domain value will the profits be maximized?

$t = \$18.75$

- 4) The income in dollars for a school talent show is $I(p) = 100p - 5p^2$, where p is the ticket price.

What ticket price(s) will result in an income of \$0?

$x = \$0, x = \20

- 5) A rectangular carpet has an area of $A(x) = x^2 + 6x - 16$ square feet.

Find the width of the carpet if the length is $x + 8$ feet.

$x - 2 ft$

- 6) The height of a baseball in feet x seconds after it is thrown is given by $h(x) = -16x^2 + 32x + 5$.

When will the ball be at a height of 7 feet?

$x = .1 sec, x = 1.9 sec$

- 7) A rectangular porch has an area of 75 square feet. The length of the porch is 4 feet longer than the width.

What is the width of the porch?

6.9 ft

- 8) A pet owner throws a tennis ball for his dog to chase. The tennis ball's height in feet x seconds after it is thrown is given by $h(x) = -16x^2 + 32x + 4$.

- a. When will the ball hit the ground?

2.1 sec

- b. When will the ball be at its highest point?

1 sec

- c. When the ball is at its highest point, how far off the ground is it?

20 ft

- 9) The fuel economy in miles per gallon of a certain vehicle is given by $f(x) = -.01x^2 + 1.2x - 5.8$, where x is the car's speed in miles per hour.

For what speed(s) does the car have a fuel economy of 22 miles per gallon?

$x = 31.4 \text{ mph}, x = 88.6 \text{ mph}$

- 10) The height of a softball in meters x seconds after it has been thrown is given by $h(x) = -4.9x^2 + 9x + 1.2$.

When does the ball hit the ground?

2 sec

- 11) A company sells about $s(x) = 20x - x^2$ units each month, where x is the price of one unit.

- a. For what price(s) does the company sell 50 units?

$x = \$2.93, x = \17.07

- b. For what price(s) does the company sell the most units?

$x = \$10$

- 12) As part of a science experiment, Carson designs and creates a cushioned egg carrier. He puts an egg inside it, and then drops it from a window that is 27 feet high to see whether his design can safely cushion the egg and keep it from breaking. The egg's height in feet x seconds after being dropped is given by $h(x) = 27 - 16x^2$.

After how many seconds will the egg hit the ground?

1.3 sec

13) Students in a physics class are testing the pull of gravity at varying heights. Each student went to a different floor of a tall office building and tossed a roll of paper streamers into the air from the window. Another student video-taped the streamers' paths downward so that they could determine the approximate equations of the parabolas the streamers created as they unraveled. When a streamer was thrown from the highest story of the building, the students determined that the distance, in inches, between the streamer and the ground t seconds after it was thrown could be expressed by $h(t) = -16t^2 + 32t + 673$.

a. After how many seconds will it reach its maximum height?

1 sec

b. How high is its maximum height?

689 ft

c. When does the streamer hit the ground?

7.6 sec

14) The path of an arrow shot in the air can be modeled by the function $h(t) = -16t^2 + 144t$, where h is the height, in feet, of the arrow above ground t seconds after it is released.

What is the highest the arrow will reach?

324 ft

15) The demand for plastic storage containers depends on their price. A retail manager determines that the number of containers she can sell at a price of x dollars each is given by the formula $d(x) = -3x^2 + 220x - 200$.

At what price will the demand for the containers be at a maximum?

$x = \$36.67$

16) The school's drama department is putting on a production. Instead of using the school's indoor stage, the department head decided to build an outdoor stage to accommodate a greater audience. The width of the outdoor stage is 6 feet less than the length.

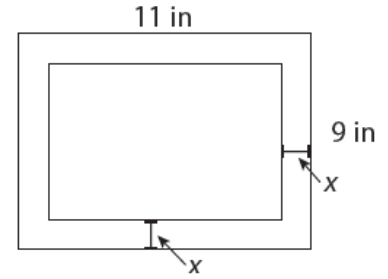
If the total area of the stage is 720 ft^2 , what are the length and width of the outdoor stage?

$l = 30 \text{ ft}, w = 24 \text{ ft}$

- 17) A family portrait hanging on the wall has a frame with dimensions of 11 inches by 9 inches.

If the width of the frame can be represented by x , what are the dimensions of the portrait if its area is 35 square inches?

$x = 2$, so length = 7, width = 5



- 18) The height $h(t)$, in feet, of a “weeping willow” firework display, t seconds after having been launched from an 80-ft high rooftop, is given by $h(t) = -16t^2 + 64t + 80$.

- a. When will it reach its maximum height?

2 sec

- b. What is its maximum height?

144 ft

- 19) The value of some stock can be represented by $V(x) = 2x^2 - 8x + 10$, where x is the number of months after January 2012.

- a. What is the lowest value $V(x)$ will reach?

\$2

- b. When did it hit the lowest value?

2 months after January 2012, so in March 2012

- 20) A rectangular garden is 30 ft by 40 ft. Part of the garden is removed in order to install a walkway of uniform width around it. The area of the new garden is one-half the area of the old garden.

How wide is the walkway?

5 ft