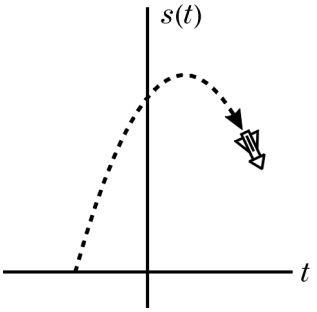
QUADRATIC APPLICATIONS 2 (MAX/MIN)

Name: _____ **Date:** _____

1. A toy rocket is launched into the air at an initial velocity of 64 ft/sec, as shown on the graph below. The function $s(t) = -16t^2 + 64t + 80$ gives the height of the rocket (in feet) at time t (seconds).



When does the rocket hit the ground?

A. $t = 4$ **B.** $t = 5$ **C.** $t = 8$ **D.** $t = 16$

2. For a certain set of road conditions the stopping distance of a car is given by the formula

$$d = 0.3s + 0.004s^2$$

where d is the stopping distance (in meters) and s is the speed of the car (in kilometers per hour).

Explore with your calculator to find the speed of a car, to the nearest kilometer per hour, that requires about 34 meters to stop.

3. A ball is thrown vertically upward with an initial velocity of 24 m/s. Its height after t seconds is given by $h = 24t - 4.9t^2$. How long does it take for the ball to drop to 10 m?

A. 0.5 s **B.** 2.6 s **C.** 4.4 s **D.** 4.9 s

4. A ball is thrown vertically upward with an initial velocity of 24 m/s. Its height after t seconds is given by $h = 24t - 4.9t^2$. How long does it take for the ball to drop to 6 m?

F. 0.3 s **G.** 3.2 s **H.** 4.6 s **J.** 5.1 s

5. The cost of driving a van at a speed of v km/h is $\$25 + 0.01v^2$ for each hour.

a) How long would it take to drive the van 100 km at a constant speed of v km/h? How much would the trip cost?

b) How fast should the driver travel in order to minimize the cost?

6. The height of a baseball related to the time it is in the air can be modeled by the equation

$$h(t) = -16t^2 + v_o t + h_o .$$

In the equation, v_o is the upward velocity (in feet per second) of the ball when $t = 0$, and h_o is the ball's height (in feet) when $t = 0$.

A certain baseball was hit at a height of $3\frac{1}{2}$ feet with an initial upward velocity of 74 feet per second. How long did the ball remain in the air?

F. about $3\frac{2}{3}$ seconds **G.** about 4 seconds

H. about $4\frac{1}{2}$ seconds **J.** about $5\frac{1}{6}$ seconds

7. The height of a model rocket related to the time it is in the air can be modeled by the equation

$$h(t) = -9.8t^2 + v_o t + h_o .$$

In the equation, v_o is the upward velocity (in meters per second) of the rocket when $t = 0$, and h_o is the rocket's height (in meters) when $t = 0$.

A certain model rocket was fired from a height of 1.6 meters with an initial upward velocity of 44 meters per second. How long did the rocket remain in the air?

A. about 3 seconds **B.** about 4.5 seconds

C. about 5 seconds **D.** about 7 seconds

8. The net profit P (in \$) for selling x cases of soup is given by $P(x) = 1500 + 20x - x^2$. The maximum net profit is

F. 1500 **G.** 1600

H. no maximum **J.** none of these

9. A rocket is launched into the air. Its height in feet above the ground is given by the function $H = -16t^2 + 176t$, where t is the number of seconds since the rocket was launched. How many seconds will it take the rocket to reach its maximum height? What is the maximum height?

A. 11 seconds, 3872 feet

B. $2\frac{3}{4}$ seconds, 363 feet

C. $3\frac{2}{3}$ seconds, 430.2 feet

D. $5\frac{1}{2}$ seconds, 484 feet

10. Jessie is participating in an egg drop contest. He drops his protected egg from a window that is 100 feet above the ground. How many seconds, to the nearest tenth, will it take for the protected egg to reach the ground?

Use the formula $d = \frac{1}{2}gt^2$ where:

d is the distance traveled

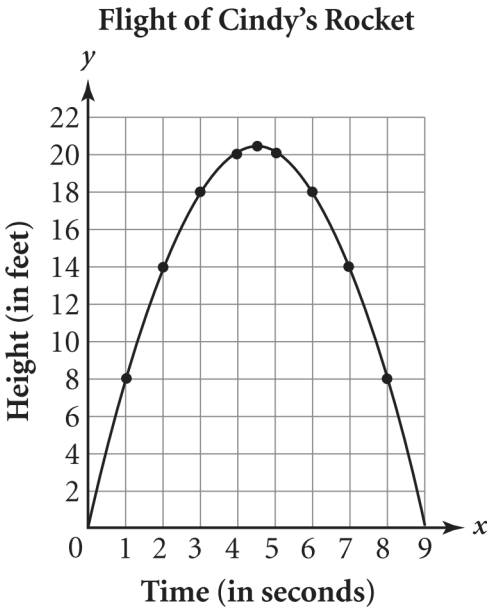
g is the acceleration due to gravity, which is $32\,\text{ft/sec}^2$

t is the time in seconds

F. 0.3 seconds **G.** 2.5 seconds

H. 3.1 seconds **J.** 6.3 seconds

11. The graph below shows the height of Cindy's model rocket during the course of its flight.



Which of these equations can be used to find the height of the rocket at any time during its flight?

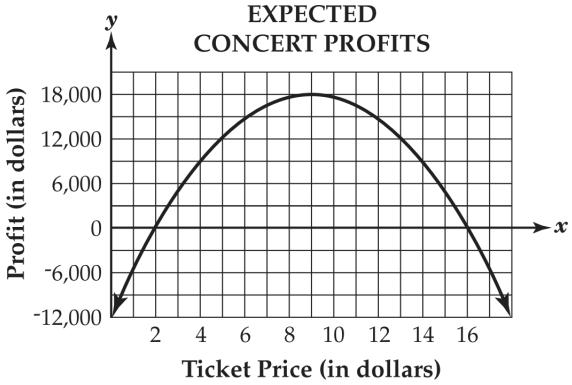
A. $y = 9x$ **B.** $y = x^2 - 81$

C. $y = -x^2 + 9x$ **D.** $y = 9 - 9x^2$

12. A ball is thrown upward. Its height (h, in feet) is given by the function $h = -16t^2 + 64t + 34$, where t is the length of time (in seconds) that the ball has been in the air. What is the *maximum* height that the ball reaches?

F. 3 ft **G.** 51 ft **H.** 63 ft **J.** 67 ft

13. The graph below models the relationship between the ticket price for a concert and the expected profits.



Which of these *best* describes the zero(s) of this function?

A. 9 is the zero, and indicates when profit is at the maximum

B. −12,000 is the zero, and indicates the cost to put on the concert

C. 2 and 16 are the zeros, and indicate the ticket price for which the profit is 0

D. 2 and 16 are the zeros, and indicate the number of tickets sold for which the profit is 0

14. A small corral is to be built so that it also has fence splitting the corral into two smaller areas to separate the animals. There is 90 m of fencing available in which to build this corral.

a) What is the maximum area that can be enclosed?

b) What are the dimensions that enclose the maximum area?

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1.
Answer: B
Objective: A2.A.1.1

2.
Answer: 62 kph
Objective: A2.A.1.1

3.
Answer: C
Objective: A2.A.1.1

4.
Answer: H
Objective: A2.A.1.1

5.
Answer: $\frac{100}{v}$, $\frac{100}{v}(25 + 0.01v^2)$; minimum cost at $v = 50$
Objective: A2.A.1.1

6.
Answer: H
Objective: A2.A.1.1

7.
Answer: B
Objective: A2.A.1.1

8.
Answer: G

9.
Answer: D
Objective: A2.A.1.1

10.
Answer: G

11.
Answer: C

12.
Answer:

13.
Answer: C

14.
Answer: 337.5 m^2; 15 m by 22.5 m
Objective: AFDA.5