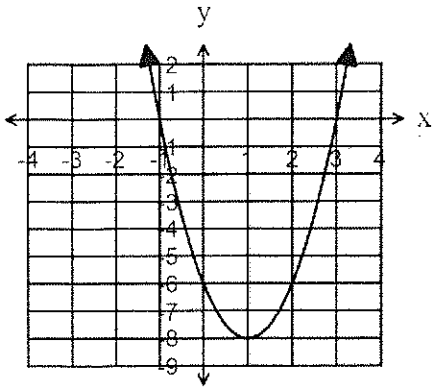
Quadratics - Unit Test

Identify the choice that best answers the question.

1. Which of the following represents a quadratic function opening downwards?

(A) $y = 3x^2(x - 1)$ (B) $y = 3x(x - 1)$ (C) $y = -3x^2(x - 1)$ (D) $y = -3x(x - 1)$

2. What is the domain and range of the quadratic function graphed?

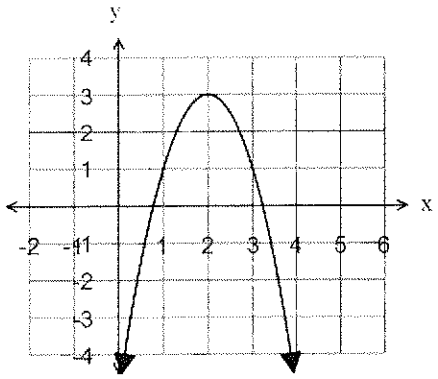


(A) Domain: $\{x| -1 \le x \le 3 ; x \in R\}$ Range: $\{x| y \ge -8 ; y \in R\}$
(B) Domain: $\{x| -1 \le x \le 3 ; x \in R\}$ Range: $\{x| y \le -8 ; y \in R\}$
(C) Domain: $\{x| x \in R\}$ Range: $\{x| y \le -8 ; y \in R\}$
(D) Domain: $\{x| x \in R\}$ Range: $\{x| y \ge -8 ; y \in R\}$

3. Which represents the quadratic function $y = -2(x + 1)(x - 3)$ in standard form?

(A) $y = -2x^2 + 6$ (B) $y = -2x^2 + 4x - 6$
(C) $y = -2x^2 - 4x - 6$ (D) $y = -2x^2 + 4x + 6$

4. Which statement is correct for the function graphed below?



(A) There is a maximum value of 3. (B) There is a maximum value of 2.
(C) There is a minimum value of 3. (D) There is a minimum value of 2.

5. Which of the quadratic functions has the narrowest graph?

A $y = -3x^2$ B $y = \frac{1}{7}x^2$ C $y = \frac{1}{3}x^2$ D $y = -4x^2$

6. The path of a marshmallow launched from a slingshot can be described by the equation $f(x) = -x^2 + 4x + 5$, where $f(x)$ is the height of the marshmallow and x is the number of seconds that have passed since the slingshot's band was released. Which of the following points shows the extremum for the function?

a. (0, 5)
c. (0, –1)
b. (2, 9)
d. (4, 5)

7. The field hockey team is hosting a battle of the bands to raise money for new equipment. In the past, the profit from the battle of the bands could be modeled by the function $P(x) = -20(x - 20)(x - 10)$, where x represents the ticket price in dollars. What is a reasonable domain for this function?

a. $-10 \le x \le 20$
c. $10 \le x \le 20$
b. $-20 \le x \le -10$
d. $-20 \le x \le 10$

8. What is the average rate of change of the function $f(x) = 6x^2 + 12x - 4$ between $x = -1$ and $x = 1$?

a. 12
c. 4
b. 24
d. –12

9. The dimensions of a community garden are such that the length is 6 feet shorter than 3 times its width. What expression describes the area of the community garden in terms of its width, w?

a. $(w + 3)(w + 6)$ ft^2
c. $3w(w - 6)$ ft^2
b. $w(6w - 3)$ ft^2
d. $w(3w - 6)$ ft^2

10. If the vertex of $f(x)$ is (3, –5), what is the vertex of $f(x + 3)$?

a. (3, –8)
c. (3, –2)
b. (6, –5)
d. (0, –5)

11. If the transformation of $f(k \cdot x)$ is applied to $f(x)$, with $0 < k < 1$, which is true about the graph of the function?

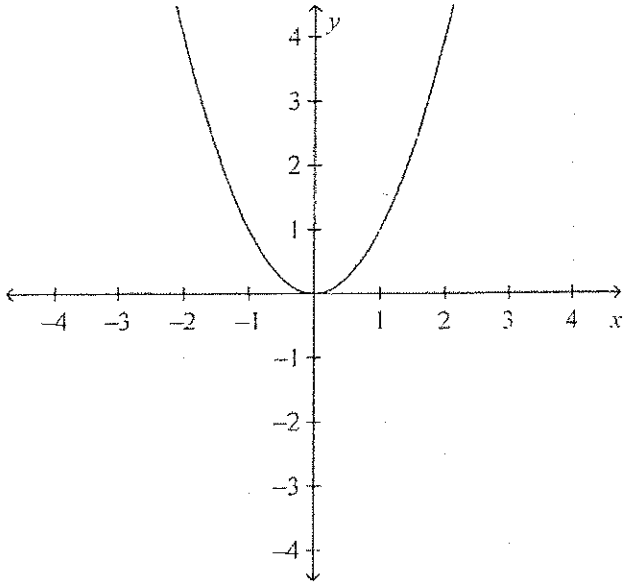
a. The graph of the original function is compressed horizontally by a factor of $\frac{1}{k}$.

b. The graph of the original function is stretched horizontally by a factor of $\frac{1}{k}$.

c. The graph of the original function is stretched vertically by a factor of k.

d. The graph of the original function is compressed vertically by a factor of k.

12. Identify the vertex of the graph. Tell whether it is a minimum or maximum.



A (0, 0); maximum
B (0, 1); maximum
C (0, 1); minimum
D (0, 0); minimum

13. A ball is thrown into the air with an upward velocity of 48 ft/s. Its height h in feet after t seconds is given by the function $h=-16t^2+48t+8$. In how many seconds does the ball reach its maximum height? Round to the nearest hundredth if necessary. What is the ball's maximum height?

A 1.5 s; 44 ft
B 3 s; 8 ft
C 1.5 s; 116 ft
D 1.5 s; 56 ft

14. Write a function that represents the parent function, $y=x^2$, after it has been translated 3 up and 2 right.

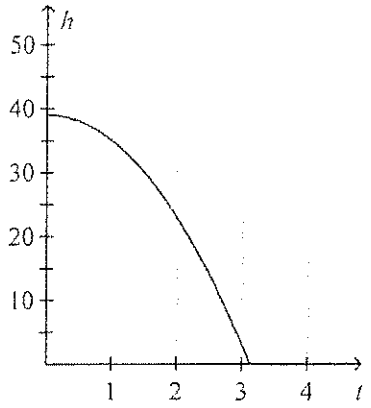
A $y=(x-3)^2+2$
B $y=(x-2)^2+3$
C $y=(x+3)^2-2$
D $y=(x+2)^2-3$

15. A rocket is shot into the air with an initial velocity of 800 m/sec. The equation $h = -16t^2 + 1440t$ models the height of the ball. How long does it take for the rocket to hit the ground (h=0)?

(a)16 seconds (b)800 seconds (c) 90 seconds (d)1440 seconds

16. If an object is dropped from a height of 39 feet, the function $h(t) = -16t^2 + 39$ gives the height of the object after t seconds. Graph the function.

A



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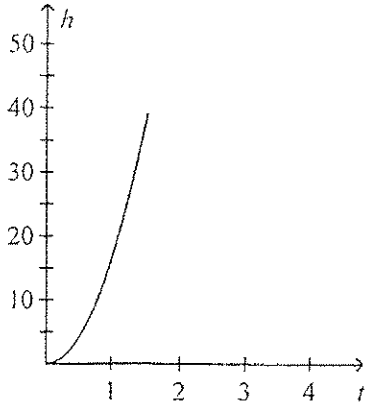
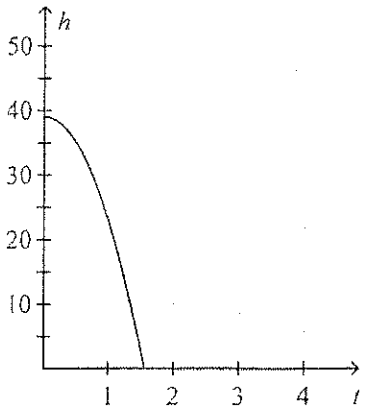


B



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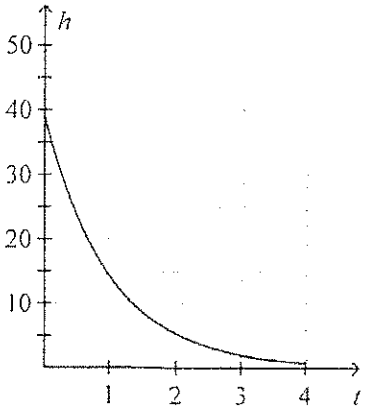
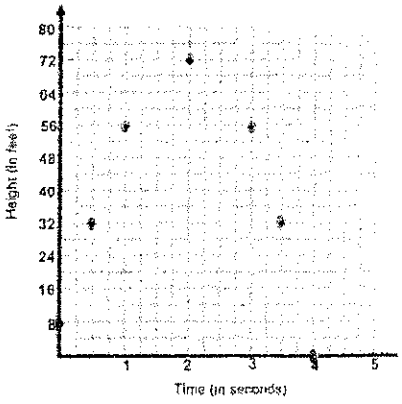


17. A ball was shot upward by a machine that was several feet above the ground with an initial speed of 64 feet per second. The height of the ball at any given time can be represented as

$$f(x) = -16x^2 + 64x + 8.$$

The graph to the right represents this function. For which of these times is the rate of change positive?



A. between 0 and 2 seconds
B. only at 2 seconds
C. between 2 and 4 seconds
D. only after 4 seconds

18. What does the y-intercept represent in this situation?

A. the time it takes the ball to reach the ground, 8 seconds.
B. the maximum height of the ball reaches in the air, 8 seconds
C. the height from which the ball is shot upward, 8 feet
D. the speed of the ball, 8 feet per second.

Constructed Response. Show all work in space provided.

19. An object is launched and follows the path expressed by the function $h(t) = -16t^2 + 16t + 32$ where h is the height at t seconds.

A. Find the height, in feet, of the object at 1 second after it is launched. Explain how you determined your answer.

B. How long will it take before the object hits the ground?

20. You are a manager at a manufacturing company, and are trying to determine the pricing for a new product. Two different consultants come up with profit prediction functions for different prices. Consultant A's predictions are summarized in the table. Consultant B's predictions are summarized in the graph.

x	$P(x)$
16	0
20	3,200
24	5,120
28	5,760
32	5,120
36	3,200

a. The ideal sale price is the price that maximizes the profit. Which function has a higher ideal sale price?

b. Which function predicts a higher maximum profit?

c. What does the domain represent in the context of the problem? What is a reasonable domain for each function?

d. What does the range represent in the context of the problem? What is a reasonable range for each function?