Quadratic Functions Lesson #7: Practice Test

1. Which of the following functions is not a quadratic function?
   A. \( f(x) = x^2 - 5x + 8 \)
   B. \( g(x) = -3(x + 5)^2 - 7 \)
   C. \( h(x) = x^3 + 4x - 2 \)
   D. \( P(x) = 1 - x^2 \)

   *Degree is 3.*

   **Use the following information to answer the next three questions.**

   - The graph of a quadratic function is shown.
   - The four points marked have integer coordinates.

2. The domain and range, respectively, of the function are
   A. \( x \in \mathbb{R} \) and \( y \leq 8 \)
   B. \( x \in \mathbb{R} \) and \( y \geq 8 \)
   C. \( -1 \leq x \leq 9 \) and \( -2 \leq y \leq 9 \)
   D. \( -1 \leq x \leq 7 \) and \( y \leq 8 \)

3. The equation of the axis of symmetry of the parabola is
   A. \( x = -1 \)
   B. \( x = 3 \)
   C. \( x = 5 \)
   D. \( x = 7 \)

   \( x = -1 + 7 = 6 \)

(Record your answer in the numerical response box from left to right.)

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4. The graph of a quadratic function has $x$-intercepts at $-8$ and at $2$ and a $y$-intercept of $6$. The equation of the axis of symmetry of the graph is

A. $x = 6$  
B. $x = -6$  
C. $x = -3$  
D. $x = -5$

\[y = \frac{-6}{2} \]

\[y = -3\]

5. The coordinates of the vertex of the graph of the function $g(x) = x^2 - 4x + 11$ are

A. $(2, 15)$  
B. $(2, 7)$  
C. $(4, -5)$  
D. $(4, 11)$

\[\text{Minimum} \ (2, 7)\]

6. The graph of the function $f(x) = ax^2 + bx + c$ is a parabola opening up and passing through the point $(0, -2)$. Which of the following must be true?

A. $a < 0$ and $c < 0$  
B. $a > 0$ and $c > 0$

C. $a < 0$ and $c > 0$  
D. $a > 0$ and $c < 0$

7. When the function is graphed on a graphing calculator, the height of the jet above the ground at its lowest point can be determined by calculating

A. the $x$-coordinate of the vertex  
B. the $y$-coordinate of the vertex  
C. the $y$-intercept  
D. the maximum value

8. The total time taken for the stunt is

A. 4.5 seconds  
B. 9 seconds  
C. 60.75 seconds  
D. 81 seconds

When jet returns to 81 m

\[y_2 = 81\]

Calc Intersect

9. The range of the function $f(x) = -3(x - 4)^2 + 9$ is all real numbers such that

\[y \leq 9\]

\[y < 0\]

A. $y \geq 9$  
B. $y \leq 9$  
C. $y \geq 4$  
D. $y \leq 4$

\[y \leq 9\]

\[\text{Maximum} \text{ Vertex is Maximum Value}\]

\[y \leq 9\]

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2. During a bounce on a trampoline, the height (h feet) of a child above the ground is related to time (t seconds) by a quadratic function of the form \( h = -4.9t^2 + 7t + 3 \). The maximum height of the child above the ground, to the nearest tenth of a foot, is ______. 

(Record your answer in the numerical response box from left to right) 

\[ \text{Graph: } 5.5 \text{ ft} \]

10. The graph of the function \( f(x) = (x - p)^2 + q \) is a parabola. Which of the following is a correct statement about the graph?

A. There is a maximum point at \((-p, q)\).  
B. There is a maximum point at \((p, q)\).  
C. There is a minimum point at \((-p, q)\).  
D. There is a minimum point at \((p, q)\). 

11. Consider the graph of the function \( f(x) = a(x - p)(x - q) \). The \( y \)-intercept and the equation of the axis of symmetry of the graph are, respectively,

A. \( pq \) and \( x = \frac{p + q}{2} \)  
B. \( apq \) and \( x = \frac{p + q}{2} \)  
C. \( pq \) and \( x = \frac{p - q}{2} \)  
D. \( apq \) and \( x = \frac{p - q}{2} \) 

12. The value of \( mn \) is

A. 8  
B. 12  
C. 16  
D. 48

13. The value of \( a \) is

A. \(-\frac{1}{3}\)  
B. \(\frac{1}{3}\)  
C. -3  
D. 3

\[ y = a(x-4)(x-12) \]

\[-16 = a(0-4)(0-12) \]

\[-\frac{1}{3} = a \]

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14. The vertex of the graph of the function \( f(x) = 2(x + c)^2 \) is
   
   A. \((0, c)\)  \quad B. \((0, -c)\) \quad C. \((c, 0)\) \quad D. \((-c, 0)\)
   
15. Jessica knows that the points \((2, 2)\) and \((-10, 2)\) lie on a parabola. The equation of the axis of symmetry of the parabola is
   
   A. \(x = -4\)  \quad B. \(x = 6\) \quad C. \(x = 8\)  \quad D. \(x = 2\)
   
   Use the following information to answer the next two questions.

   In a soccer game, the ball is passed back to the goal keeper. She kicks the ball from ground level up the field.

   The height, \(h\) metres, of the ball above the ground can be modelled by the equation
   \[ h = -0.03(d - 28)^2 + 12 \]
   where \(d\) is the distance, in metres, from the goal line.

   A student graphs the path of the ball on a graphing calculator. The student's screenshot is shown.

   **Numerical Response** 3. The maximum height, in metres, of the soccer ball above the ground is _____.

   (Record your answer in the numerical response box from left to right.)

   12 m

   **Numerical Response** 4. When the ball reaches its maximum height, the distance, in metres, from the goal line is _____.

   (Record your answer in the numerical response box from left to right.)

   28 m

   **Numerical Response** 5. The horizontal distance, in metres, travelled by the ball when it hits the ground for the first time is _____.

   (Record your answer in the numerical response box from left to right.)

   40 m

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Written Response - 5 marks

The cross section of a river, from one bank to the other, can be represented by the function

\[ d(w) = 0.1(w - 6)^2 - 3.6 \]

where \( d(w) \) is the depth, in metres, of the river \( w \) metres from the left edge of the river bank.

- State the coordinates of the vertex of the graph of the function \( d(w) \).
  \[ (6, -3.6) \]

- For each of the following, explain without the aid of a graphing calculator, how to determine the answer from the vertex. State the answer.

  i) What is the depth of the river at its deepest point?
     The \( y \)-coordinate of the vertex is the minimum value.
     The deepest part of the river is 3.6 metres.

  ii) How far, from the left edge of the river bank, is the deepest part of the river?
    The \( x \)-coordinate of the vertex is the distance across the river where the deepest part may be found.
    The deepest point is 6 metres from the left bank.

  iii) How wide is the river?
    The deepest point is halfway across, so simply double the distance above.
    \[ 6 \times 2 = 12 \]
    The river is 12 metres wide.

  iv) What is a suitable domain and range for this problem?
    The domain should span the width of the river, so \( 0 \leq w \leq 12 \), \( w \in \mathbb{R} \)
    The range should encompass all possible river depths, so \( -3.6 \leq d \leq 0 \), \( d \in \mathbb{R} \).
Answer Key

Multiple Choice

Numerical Response
1. 2  2. 5  3. 1  4. 2  5. 4

Written Response
1. * vertex (6, -3.6)
   * The second coordinate of the vertex is the minimum value, therefore the depth of the deepest part at the river is 3.6 metres.
   * The first coordinate of the vertex will tell us how far the deepest part of the river is from the left edge of the river bank. The answer is 6 metres.
   * The deepest part of the river is halfway across. Therefore the width of the river is double the first coordinate of the vertex.
   * The domain consists of all values of w from the left edge to the right edge of the river bank.
Therefore the domain is \{w \mid 0 \leq w \leq 12, w \in \mathbb{R}\}.
The range is all values of d from the deepest point to zero.
Therefore the range is \{d \mid -3.6 \leq d \leq 0, d \in \mathbb{R}\}. 