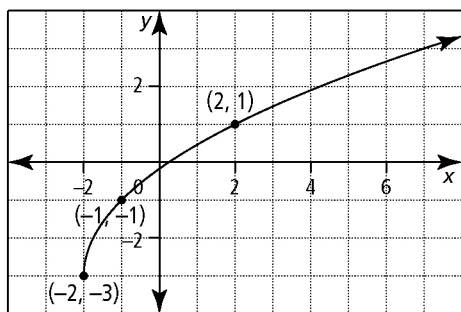Name: _____     Date: _____

# Unit 1 Test

**Multiple Choice**

*For #1 to #5, choose the best answer.*

1. The function $y = f(x)$ contains the point $(2, -3)$. The graph of $y = f(x)$ is stretched vertically by a factor of 3 about the $x$-axis and translated right 3 units. The new coordinates of the point are

   **A** $(-1, -1)$

   **B** $(5, -1)$

   **C** $(-1, -9)$

   **D** $(5, -9)$

2. What is the equation of the function shown in the following graph?

   

   **A** $y = \sqrt{2(x-2)} + 3$

   **B** $y = \sqrt{2(x+2)} - 3$

   **C** $y = 2\sqrt{(x-2)} + 3$

   **D** $y = 2\sqrt{(x+2)} - 3$

3. The graph of the function $f(x) = x^3$ is transformed to obtain the function $g(x) = f(x - h) + k$. The point $(0, 0)$ on $f$ maps onto $(2, 1)$ on $g$. What is the $x$-intercept of the graph of $g(x)$?

   **A** $-7$

   **B** $-1$

   **C** $1$

   **D** $3$

4. If $f(x) = x^2 - 3$, then the domain of $y = \sqrt{f(x)}$ is

   **A** $\{x \mid x \le -\sqrt{3}, x \ge \sqrt{3}, x \in R\}$

   **B** $\{x \mid -\sqrt{3} \le x \le \sqrt{3}, x \in R\}$

   **C** $\{y \mid y \ge 0, y \in R\}$

   **D** $\{y \mid y \ge -3, y \in R\}$

5. A polynomial, $P(x)$, is divided by $x - 3$. If the remainder is 5, then $P(x)$ is

   **A** $x^3 - 2x^2 - 3x - 5$

   **B** $x^3 + 2x^2 - 3x + 5$

   **C** $x^3 - 2x^2 - 3x + 5$

   **D** $x^3 + 2x^2 - 3x - 5$

**Numerical Response**
*Complete the statements in #6 to #10.*

6. The graph of the function $f(x) = |x|$ is transformed by a vertical stretch by a factor of $\dfrac{1}{2}$, a reflection about the $x$-axis, and a vertical translation up 2 units. The range of the transformed function is ☐.

7. The $y$-intercept of the function $y = f(x)$ is $-2$. The graph of the function is transformed to obtain the graph of the function $y = -2f(x - 3)$. The coordinates of the image point are ☐.

8. The graph of the function $y = \sqrt{x + 4}$ is reflected about the line $y = x$. The new $x$-intercept is ☐.

9. The graph of the function $f(x) = x^2$ is transformed to obtain the graph of the function $g(x) = f(-3x - a)^2$. If the point $(-2, 5)$ is on $g(x)$, the value of $a$ is ☐.

10. If $f(x) = x^3 - 8x^2 + 4x + 48$ and $g(x) = f(2x)$, the zeros of $g(x)$ are ☐.
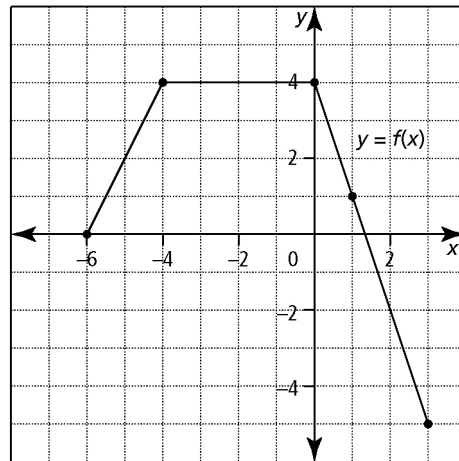
**Written Response**

**11.** The graph of the function $f(x) = x^2$ is transformed to obtain the graph $g(x) = 2f(x + 1)^2 - 3$.

 **a)** Describe the transformation in words.

 **b)** Write the equation of the function $g(x)$ in two forms.

 **c)** Determine the range of $g(x)$.

 **d)** Determine the equation of the inverse of $g(x)$.

 **e)** What restrictions could be placed on the domain of $g(x)$ so the inverse is also a function?

**12.** The graph of the function $f(x) = \sqrt{x}$ is transformed by a reflection about the $y$-axis, a translation down 1 unit, and a translation right 2 units.

 **a)** State the equation of the transformed function $g(x)$ and sketch the graph.

 **b)** Solve $g(x) = 0$ algebraically.

 **c)** Describe how the graph of $g(x)$ can be used to support your answer to part b).

**13.** The graph of $y = f(x)$ is shown below.



 **a)** Sketch the graph of the inverse function $x = f(y)$.

 **b)** Sketch the graph of $y = \sqrt{f(x)}$ .

 **c)** Identify the common invariant point(s) in parts a) and b). Explain.

**14. a)** Factor the polynomial $h(x) = x^3 + 6x^2 + 11x + 6$.

 **b)** Sketch the graph of $h(x)$. Identify the $x$-intercepts.

 **c)** Solve the equation $0 = x^3 + 6x^2 + 11x + 6$.

 **d)** Identify and explain the relationship between the answers to parts b) and c).

**15.** The polynomial function $P(x) = x^4 + 4x^3 + ax^2 + bx$ has a remainder of 40 when divided by $x - 2$ and a remainder of 4 when divided by $x + 1$. Determine the values of $a$ and $b$.