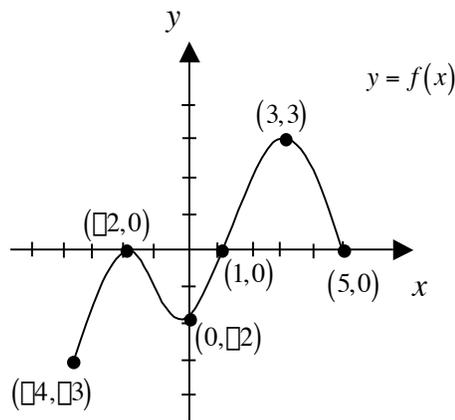


1. Given the functions $f(x) = x^2 - 4$ and $g(x) = 3x + 1$, find $\frac{f}{g}(3)$.

- A. $\frac{5}{8}$
- B. $\frac{13}{8}$
- C. $\frac{5}{8}$
- D. $\frac{13}{8}$
- E. None of the above

Use the graph of the function $y = f(x)$, shown below, to answer questions #2 and #3:



2. Find the intervals for which f is increasing.

- A. $[-3, 0] \cup [2, 3]$
- B. $[1, 5]$
- C. $[-4, -2] \cup [3, 5]$
- D. $[-3, 0]$
- E. None of the above

3. Find all values of x such that $f(x) < 0$.

- A. $[-2, 0] \cup [3, 5]$
- B. $[-4, -2] \cup (-2, 1)$
- C. $[-3, 0] \cup (0, 1)$
- D. $[0, 1] \cup (1, 5)$
- E. None of the above

4. Find the domain of the function $h(x) = \frac{\sqrt{2x+8}}{x^2+4x+5}$. Express your answer in interval notation.

- A. $(-1, 1) \cup (1, 4]$
 B. $[4, \infty)$
 C. $(-1, 1) \cup (1, 5) \cup (5, \infty)$
 D. $[4, 5) \cup (5, \infty)$
 E. None of the above

5. If the point $P(1, 2)$ is on the graph of the function $y = f(x)$, find the corresponding point on the graph of $y = 3f(2x)$.

- A. $(3, 4)$
 B. $(\frac{1}{2}, 6)$
 C. $(\frac{1}{3}, 4)$
 D. $(2, 6)$
 E. None of the above

6. Given that f is a function such that $f(2) = 5$ and $f(1) = 3$, and g is a function such that $g(3) = 8$ and $g(1) = 2$, find and simplify $(g \circ f)(1)$.

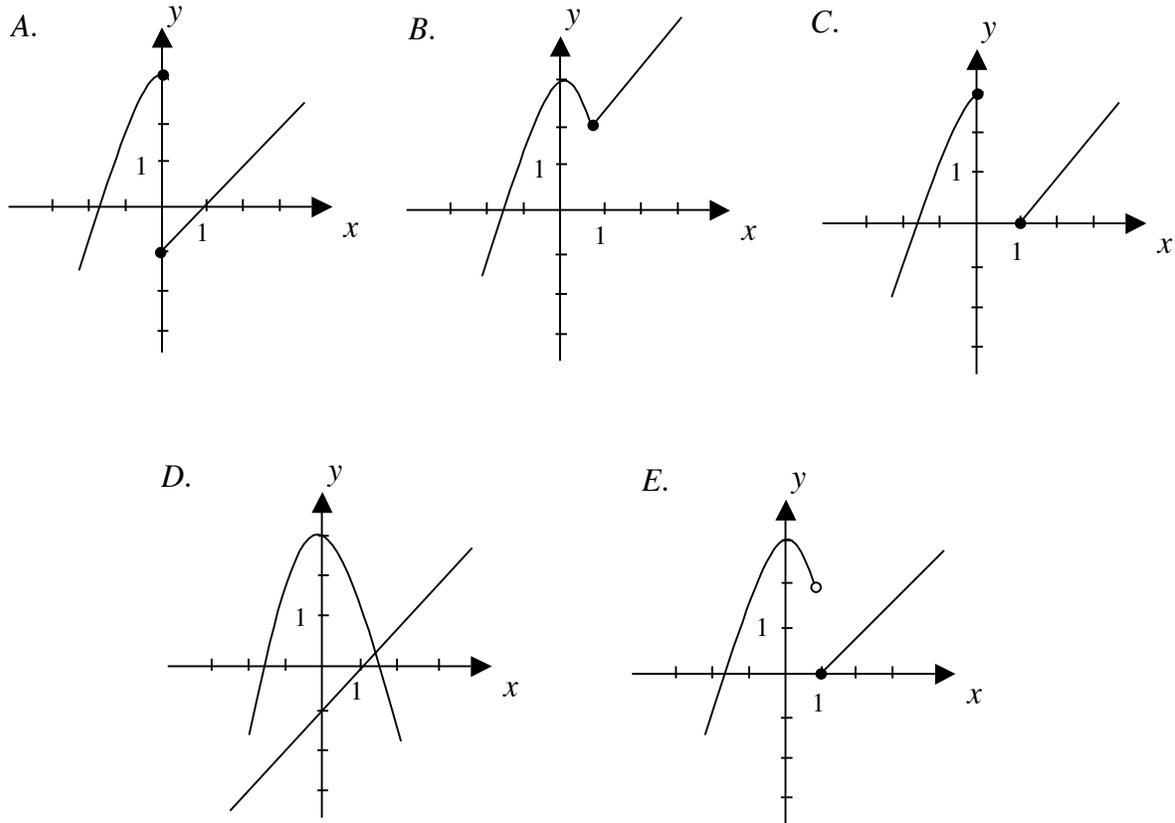
- A. 5
 B. 6
 C. 8
 D. 2
 E. Cannot be determined

7. Given the function $f(x) = \frac{4}{x} + 5$, find the inverse function, f^{-1} .

- A. $f^{-1}(x) = \frac{4}{x+5}$
 B. $f^{-1}(x) = \frac{x+20}{4}$
 C. $f^{-1}(x) = \frac{x}{4+5x}$
 D. $f^{-1}(x) = \frac{x+5x}{4}$
 E. $f^{-1}(x) = \frac{4+5x}{x}$

8. Which of the following depicts the graph of the function below?

$$g(x) = \begin{cases} 3 - x^2 & \text{if } x < 1 \\ x - 1 & \text{if } x \geq 1 \end{cases}$$



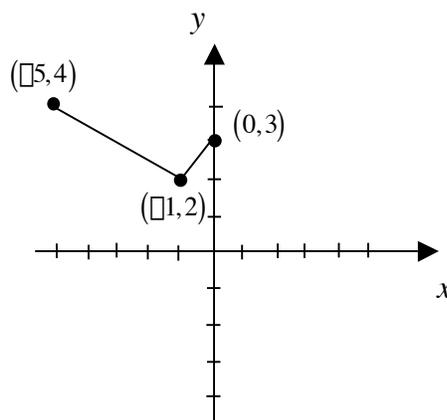
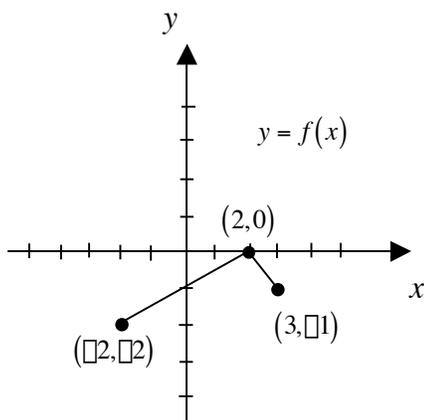
9. Given the parabola $f(x) = x^2 + 4x + 21$, state and identify the maximum or minimum value.

- A. 17; minimum
- B. 21; maximum
- C. 17; maximum
- D. 21; minimum
- E. There is no maximum or minimum value

10. Given $f(x) = x^2 - 3$, find and simplify $\frac{f(a+h) - f(a)}{h}$, if $h \neq 0$.

- A. $2a + h - 6$
- B. $h - 6$
- C. $2a + h$
- D. h
- E. None of the above

11. Given below, on the left, is the graph of a basic function, $y = f(x)$. The graph on the right was obtained by shifting, reflecting, stretching, and/or compressing the basic graph. Which of the following best describes the graph on the right?



- A. $y = -f(x - 2) + 3$
- B. $y = -f(x + 3) + 2$
- C. $y = -f(x + 2) + 3$
- D. $y = -f(x - 3) + 2$
- E. $y = -f(x + 3) - 2$

12. Solve the following inequality. Express your answer in interval notation.

$$\frac{(x + 3)(x - 5)}{x + 1} > 0$$

- A. $(5, \infty)$
- B. $(-\infty, -3) \cup (1, 5)$
- C. $(-\infty, -1) \cup (1, \infty)$
- D. $(-3, -1) \cup (5, \infty)$
- E. None of the above

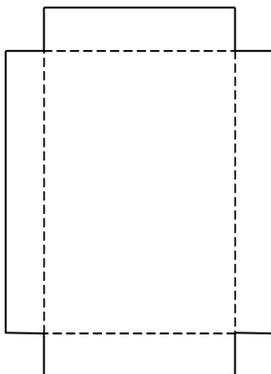
13. Suppose w is directly proportional to the product of x and the square root of y , and inversely proportional to the sum of v and z . If $x = 2$, $y = 9$, $v = 4$, and $z = 5$, then $w = 5$. Find the value of the constant of proportionality, k .

- A. $k = 0.28$
 B. $k = 3.3$
 C. $k = 7.5$
 D. $k = 10.2$
 E. None of the above

14. While skipping a stone on a lake, Nate noticed the path the stone took was in the shape of a series of parabolas. During one particular hop, the stone went a horizontal distance of 6 feet and the maximum height off the lake was 4 feet. If $y =$ height of the stone and $x =$ horizontal distance the stone traveled in feet, find the standard equation for the path of the stone during this hop.

- A. $y = -\frac{2}{9}(x - 3)^2 + 4$
 B. $y = -\frac{4}{9}(x - 3)^2 + 4$
 C. $y = -\frac{2}{9}(x - 2)^2 + 6$
 D. $y = -\frac{3}{2}(x - 2)^2 + 6$
 E. None of the above

15. An open box is to be made from a rectangular piece of cardboard having dimensions 40 inches by 60 inches by cutting identical squares of area x^2 from each corner and turning up the sides (see the figure). Express the volume, V , of the resulting box as a function of x . Simplify your function.



- A. $V(x) = 2400x$
 B. $V(x) = x(40 - x)(60 - x)$
 C. $V(x) = 4x(20 + x)(30 + x)$
 D. $V(x) = 2400(40 - x)(60 - x)$
 E. $V(x) = 4x(20 - x)(30 - x)$

