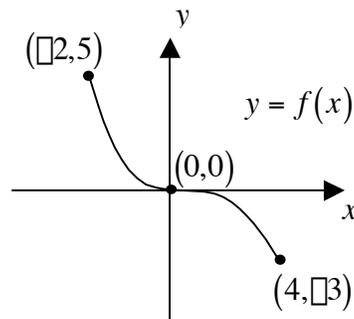1. Given the function $g(x) = \dfrac{3+x}{2-x}$, find and simplify $g\left(\dfrac{1}{a}\right)$.

     A. $\dfrac{3+a}{2-a}$

     B. $\dfrac{2a-1}{3a+1}$

     C. $\dfrac{3a+1}{2a-1}$

     D. $\dfrac{(3a+1)(2a-1)}{a^2}$

     E. $\dfrac{2-a}{3+a}$

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

2. Find the domain, D, and the range, R, for the function $y = f(3x)$.

     A. $D = \left[-\dfrac{2}{3}, \dfrac{4}{3}\right]$; $R = [-3,5]$

     B. $D = [-2,4]$; $R = [-9,15]$

     C. $D = [-6,12]$; $R = [-3,5]$

     D. $D = [-2,4]$; $R = \left[-1, \dfrac{5}{3}\right]$

     E. None of the above

3. Find the domain, D, of the inverse function, $y = f^{-1}(x)$.

     A. $D = [-4,2]$

     B. $D = [-3,5]$

     C. $D = \left[-\dfrac{1}{2}, 2\right]$

     D. $D = [-5,3]$

     E. Cannot be determined

4. Solve the system: $\begin{cases} 2x + 3y = 11 \\ 8x + 12y = 20 \end{cases}$

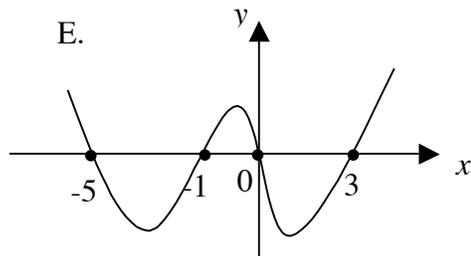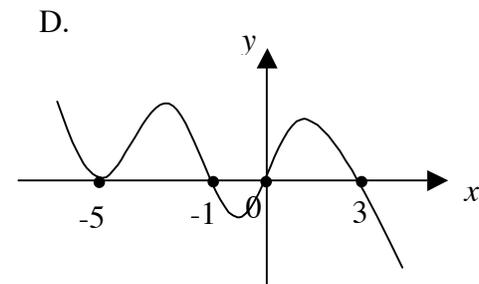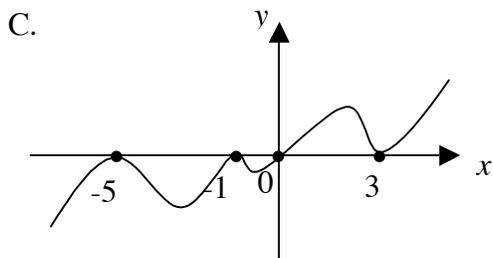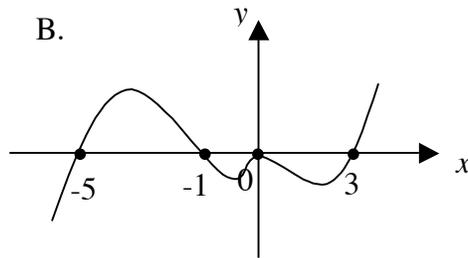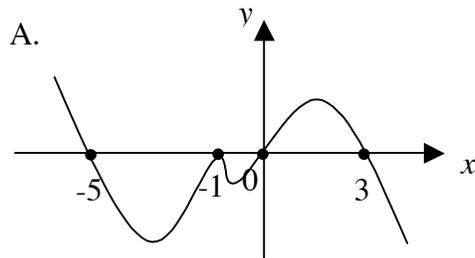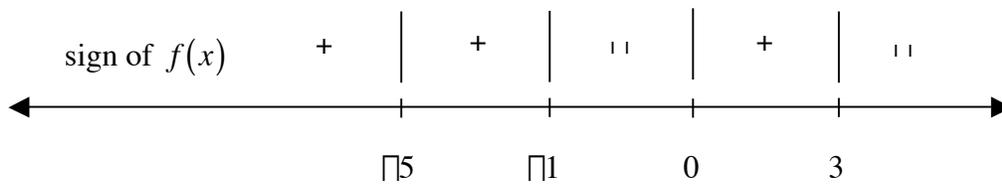A. $\left(0, \dfrac{11}{3}\right)$

B. $\left(9, -\dfrac{7}{3}\right)$

C. $\left(\dfrac{5}{2}, 0\right)$

D. There is no solution.

E. All ordered pairs (x, y) such that $2x + 3y = 11$.

5. Given below is the sign chart for a function. Which of the following could be the graph of the function?

A.

B.

C.

D.

E.

6. Assume y is directly proportional to the sum of x and the square root of w and inversely proportional to r. If $x = 4$, $w = 36$, and $r = 2$, then $y = 7$. Find y if $x = 8$, $w = 9$, and $r = 4$.

A. $y = 2.75$

B. $y = 3.85$

C. $y = 4.75$

D. $y = 1.62$

E. None of the above

7. Explain how the graph of the function $y = -f(x + 5)$ compares to the graph of $y = f(x)$.

A. Reflect the graph of $y = f(x)$ through the x-axis and shift right 5.

B. Reflect the graph of $y = f(x)$ through the y-axis and shift left 5.

C. Reflect the graph of $y = f(x)$ through the x-axis and shift left 5.

D. Reflect the graph of $y = f(x)$ through the y-axis and shift right 5.

E. None of the above

8. Given $f(x) = \dfrac{4}{3x + 5}$ and $g(x) = 3x + 1$, find and simplify $(g \circ f)(-2)$.

A. -11

B. 20

C. $-\dfrac{2}{5}$

D. $-\dfrac{4}{3}$

E. None of the above

9. Find the intervals for which the graph of $y = 4(x + 1)^2 - 3$ is increasing.

A. $[1, \infty)$

B. $[-1, \infty)$

C. $(-\infty, 1]$

D. $(-\infty, -1]$

E. None of the above

3

10. Given the function $f(x) = 5 - 2x^2$ for $x \le 0$, find the inverse function, f^{-1}.
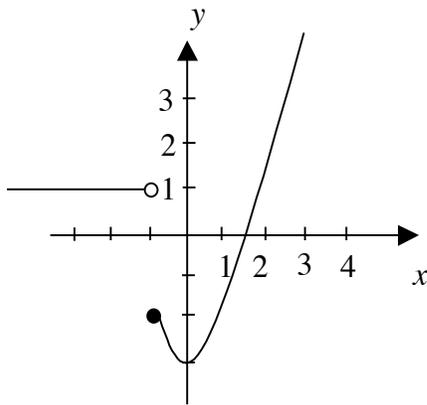
A. $f^{-1}(x) = \dfrac{1}{5 - 2x^2}$

B. $f^{-1}(x) = -\sqrt{\dfrac{5 - x}{2}}$

C. $f^{-1}(x) = \dfrac{x - 5}{4}$

D. $f^{-1}(x) = -\sqrt{\dfrac{x - 5}{2}}$

E. $f^{-1}(x) = \dfrac{5 - x}{4}$

11. Given below is the graph of a piecewise-defined function. Choose the function that corresponds to this graph.

A. $f(x) = \begin{cases} -1 & \text{if } x < 1 \\ x^2 - 3 & \text{if } x \ge 1 \end{cases}$

B. $f(x) = \begin{cases} 1 & \text{if } x < -1 \\ 3 - x^2 & \text{if } x \ge -1 \end{cases}$

C. $f(x) = \begin{cases} -1 & \text{if } x \le 1 \\ x^2 - 3 & \text{if } x > 1 \end{cases}$

D. $f(x) = \begin{cases} 1 & \text{if } x \le -1 \\ x^2 - 3 & \text{if } x > -1 \end{cases}$

E. $f(x) = \begin{cases} 1 & \text{if } x < -1 \\ x^2 - 3 & \text{if } x \ge -1 \end{cases}$

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

$(x + 1)(x - 3)^2(x + 4) > 0$

A. $(-1, 3) \cup (3, \infty)$

B. $(-4, -1) \cup (3, \infty)$

C. $(-\infty, -4) \cup (-4, -1)$

D. $(-\infty, -4) \cup (-1, 3) \cup (3, \infty)$

E. $(-4, -1) \cup (3, \infty)$

13. An apartment manager has found that 45 units of his building are occupied when the rent is $520 per month. However, when the rent is lowered to $480 per month, the number occupied is 53 units. If the number of occupied units, N, is linearly related to the rent charged, r, express N in terms of r.

A. $N = -\dfrac{1}{5}r + 529$

B. $N = -5r + 295$

C. $N = -\dfrac{1}{5}r + 59$

D. $N = -5r + 745$

E. $N = -\dfrac{1}{5}r + 149$

14. During a recent baseball game, a batter popped up a pitch into the shallow outfield. The path the ball took was in the shape of a parabola. The ball was not caught and landed on the ground after 4 seconds. Let y = the height of the ball in feet and x = time in seconds. If the maximum height the ball reached was 120 feet, find a standard equation for the path of the ball. Disregard the height of the batter.
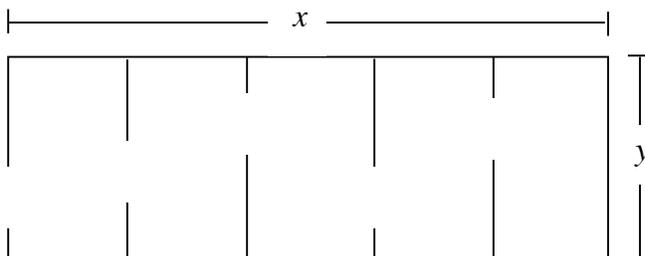
A. $y = -7.5(x - 4)^2 + 120$

B. $y = -30(x - 2)^2 + 120$

C. $y = -x^2 + 120$

D. $y = -7.5(x + 4)^2 + 120$

E. $y = -30(x + 2)^2 + 120$

15. A farmer is to build 5 rectangular pens of equal size with openings as shown in the figure. Each opening is 6 feet wide and the total area is to be 3000 square feet. If x represents the total length and y the width, express the amount of fencing needed, F, as a function of x. Simplify the function.

A. $F(x) = 2x + \dfrac{18,000}{x} - 30$

B. $F(x) = x\left(\dfrac{1,515 - x}{3}\right)$

C. $F(x) = x + \dfrac{18,000}{x} - 36$

D. $F(x) = x\left(\dfrac{315 - x}{3}\right)$

E. $F(x) = x + \dfrac{3,600}{x} - 36$