

1. The solution set for the inequality $-\frac{1}{2}(3x - 1) > 9$, written in interval notation, is

(a) $\left(-\frac{17}{3}, \infty\right)$

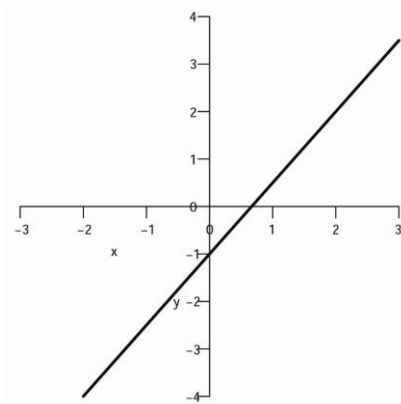
(b) $\left[-\frac{17}{3}, \infty\right)$

(c) $\left(-\infty, -\frac{17}{3}\right)$

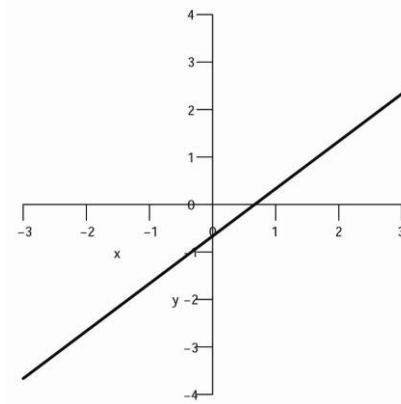
(d) $\left(-\infty, -\frac{17}{3}\right]$

(e) $\left(-\infty, \frac{17}{3}\right)$

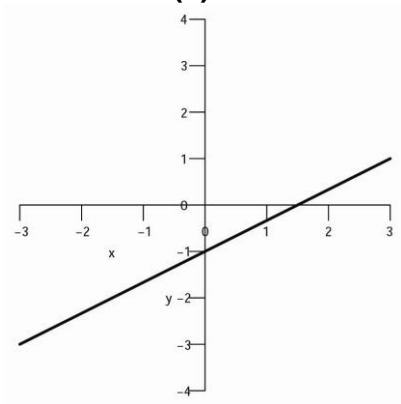
2. Which of the following graphs is the graph of the function $f(x) = \frac{2}{3}x - 1$?



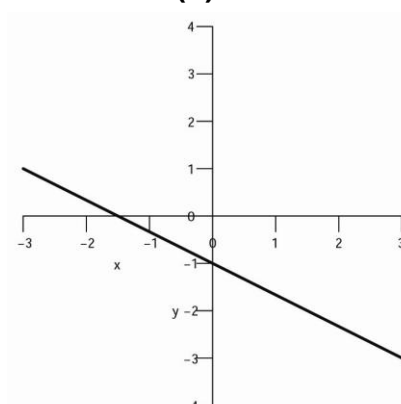
(a)



(b)



(c)



(d)

3. Which of the following is the y -intercept of the line determined by the equation $2x - 3y = \frac{1}{2}$?
- (a) $\left(0, \frac{1}{6}\right)$
 - (b) $\left(0, \frac{2}{3}\right)$
 - (c) $\left(0, \frac{1}{2}\right)$
 - (d) $\left(0, -\frac{1}{6}\right)$
 - (e) $\left(0, -\frac{2}{3}\right)$
4. The complete factorization of the polynomial expression $4x^3 + 14x^2 - 30x$ is
- (a) $x(4x - 6)(x + 5)$
 - (b) $2x(2x - 3)(x + 5)$
 - (c) $x(2x - 3)(2x + 10)$
 - (d) $2x(2x^2 + 7x - 15)$
 - (e) $2x(x - 3)(2x + 5)$
5. Evaluate the expression $\frac{|a| - \sqrt[3]{b+c}}{c-b}$ when $a = -1, b = 4$, and $c = -12$.
- (a) $\frac{1}{16}$
 - (b) $-\frac{1}{16}$
 - (c) $\frac{3}{16}$
 - (d) $-\frac{3}{16}$
 - (e) The expression is undefined for the given values of a, b , and c .
6. If $x, y \neq 0$, the expression $\left(\frac{x^{-2}}{4y^0}\right)^{-1}$ is equivalent to
- (a) $\frac{1}{4x^2}$
 - (b) 0
 - (c) $4x^2$
 - (d) $-4x^2$
 - (e) $-\frac{4y}{x^2}$

7. The solution to the system of equations $\begin{cases} \frac{1}{10}x - \frac{1}{2}y = -\frac{8}{5} \\ 4x + y = -22 \end{cases}$ is

- (a) $(-6, 2)$
- (b) $(6, 2)$
- (c) $\left(-\frac{48}{5}, \frac{82}{5}\right)$
- (d) $\left(-\frac{17}{2}, 12\right)$
- (e) $(0, -22)$

8. Chris is trying to solve the equation $x^2 + 10x = -25$, and performs the following steps:

Step 1: Factor the left-hand side: $x^2 + 10x = x(x + 10) = -25$.

Step 2: Set each factor equal to -25: $x = -25$ or $x + 10 = -25$.

Step 3: Solving for x in each linear equation, we get that $x = -25$ or $x = -35$.

Three observations labeled I, II, and III are listed. Choose the letter choice (a), (b), (c), or (d) which gives all true observations.

- I. Chris's solution is correct.
- II. Chris's factorization in step 1 is incorrect.
- III. Chris cannot set each factor equal to -25 in step II.

- (a) I, only
- (b) II, only
- (c) III, only
- (d) II and III, only

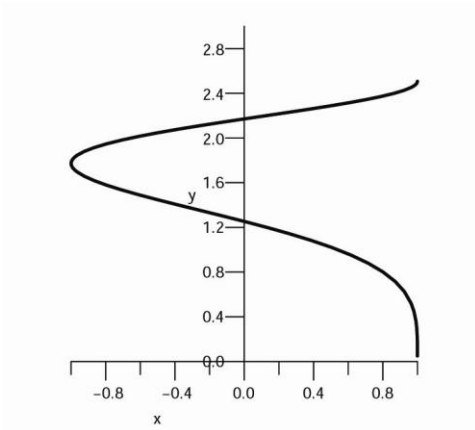
9. The distance from the Earth to the sun is approximately 93,000,000 miles. In scientific notation, this quantity is written as

- (a) 9.3 miles
- (b) 9.3×10^6 miles
- (c) 9.3×10^7 miles
- (d) 9.3×10^{-7} miles
- (e) 93×10^6 miles

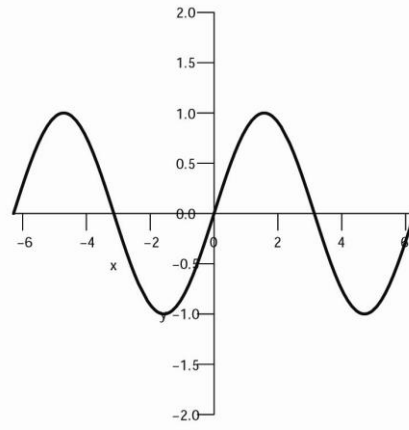
10. If $f(x) = 4 - x + 3x^3$ and $g(x) = x^3 + x - 4$, which of the following is a formula for the function $(f - g)(x)$?

- (a) $2x^3$
- (b) $4x^3$
- (c) $2x^3 + 2x + 8$
- (d) $2x^3 - 2x + 8$
- (e) $4x^3 - 2x + 8$

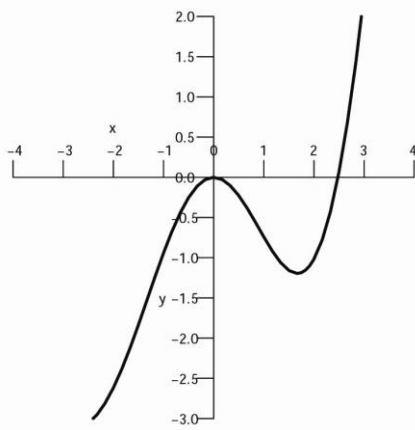
11. Which of the following relations does **not** define y as a function of x ?



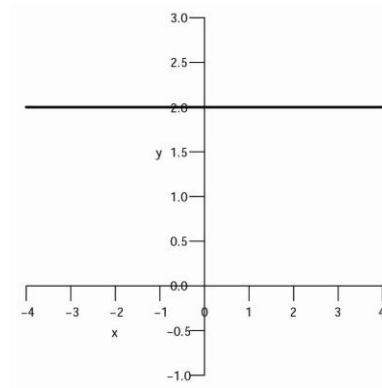
(a)



(b)



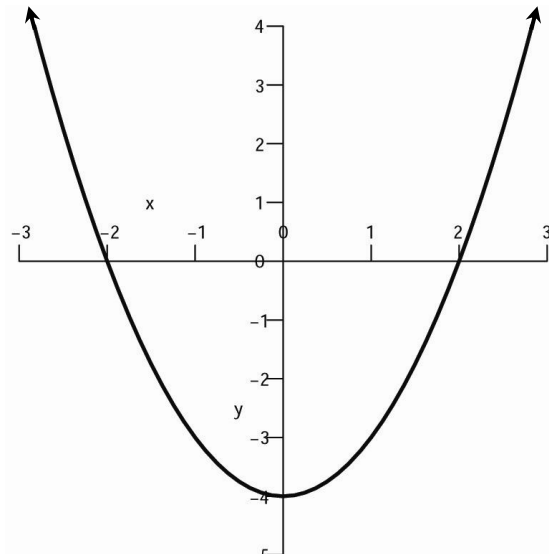
(c)



(d)

12. What is the range of the function graphed to the right?

- (a) $[-2, 2]$
- (b) $[-4, 4]$
- (c) $(-4, \infty)$
- (d) $[-4, \infty)$
- (e) $(-\infty, \infty)$



13. Multiply out completely: $(x^2 + 2x + 1)(x - 3)$.

- (a) $x^3 - x^2 - 5x - 3$
- (b) $(x + 1)^2(x - 3)$
- (c) $x^3 - 3x^2 - 3$
- (d) $x^3 - 3x^2 - 7x - 3$
- (e) $2x^3 - x^2 - 5x - 3$

14. The equation of the line passing through the origin perpendicular to the line $15x - 4y = 120$ is

- (a) $y = \frac{15}{4}x + 120$
- (b) $y = -\frac{4}{15}x - 120$
- (c) $y = \frac{15}{4}x$
- (d) $y = \frac{4}{15}x$
- (e) $y = -\frac{4}{15}x$

15. If $f(x) = -2^x + \sqrt{x}$, what is the value of $f(4)$?

- (a) 18
- (b) -14
- (c) -6
- (d) 14
- (e) 0

16. When defined, the expression $\frac{6}{b-a} + \frac{6}{a-b}$ simplifies to

- (a) $\frac{12}{a-b}$
- (b) $\frac{12}{(a-b)(b-a)}$
- (c) 0
- (d) $\frac{12(a-b)}{b-a}$
- (e) $\frac{6}{a} - \frac{6}{b}$

17. Danielle observes that the graph of $f(x)$ is the reflection of the graph of $g(x)$ over the line $y = x$. This observation correctly leads Danielle to believe that
- (a) $(f \circ g)(x) = x$
 - (b) $(f + g)(x) = 0$
 - (c) $(fg)(x) = 1$
 - (d) $\left(\frac{f}{g}\right)(x) = 1$
 - (e) $(f - g)(x) = f(x)$
18. Elise is solving the equation $x^2 + 3x = 7$ by completing the square. What quantity should she add to both sides of the equation so that the left-hand side of the equation is a perfect square trinomial?
- (a) 0
 - (b) 9
 - (c) 6
 - (d) $\frac{9}{4}$
 - (e) $\frac{3}{2}$
19. Nick is trying to simplify the expression $\sqrt[3]{-27x^5}$ and he rewrites the expression as $(-27x^5)^3$. Nick's friend Todd attempts to help Nick and tells him the following two statements:
- I. $(-27)^3 = -3$.
 - II. Nick should have written that $\sqrt[3]{-27x^5} = (-27)^3 x^{5/3}$.
- Which choice lists all true statements?
- (a) I, only
 - (b) II, only
 - (c) I and II
 - (d) Neither statement is true.
20. If $f(x) = \log_2(x)$ and $g(x) = 2^{-9}$ then $(f \circ g)(x)$ is
- (a) 2
 - (b) 9
 - (c) -9
 - (d) 2^{-9}
 - (e) 9^{-2}

Part II: Answer each question completely, showing all work to answer each question.

21. [12 points] Simplify the complex fraction $\frac{\frac{1}{x+h} - \frac{1}{x}}{h}$ when $x, h, x+h \neq 0$.

22. [4 points each] Simplify each of the following expressions:

(a) $\log_2(16)$

(b) $\log(\sqrt{10})$

(c) $\log(1)$

(d) $\log(10^{75})$

23.[12 points] Solve the equation $3x^2 = 2x + 6$ for x . Simplify your solution(s) completely.

24.[12 points] Simplify the expression $\sqrt[5]{-32x^{10}y^8}$ and write the final answer using only exponent notation and **not** radical notation.

25. [4 points each] If $f(x) = x^2 - 1$, $g(x) = 2x + 3$, and $h(x) = \frac{x - 3}{2}$, find

formulas for the following functions:

(a) $(f + g)(x)$

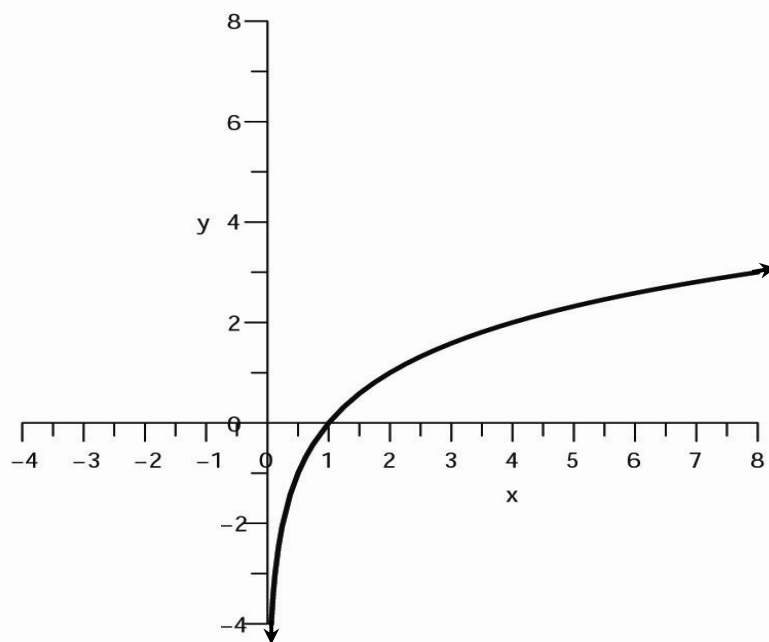
(b) $(f \circ g)(x)$

(c) $(g \circ f)(x)$

(d) $(g \circ h)(x)$

26.[12 points] Solve the equation $\frac{3}{x-1} - \frac{2}{x+4} = \frac{x^2 + 8x + 6}{x^2 + 3x - 4}$ for x .

27. Below is the graph of the function $f(x) = \log_2 x$.



- (a) [3 points] Todd claims that $f(x)$ has an inverse function. Explain why Todd is correct.
- (b) [6 points] Graph $f^{-1}(x)$ on the coordinate plane on which $f(x)$ is graphed, labeling the x and y coordinates of two points on the graph of $f^{-1}(x)$.
- (c) [6 points] Find the values of $f^{-1}(3)$ and $f^{-1}(-2)$.
- (d) [6 points] Find a formula for $f^{-1}(x)$. Explain how you found this formula.