

# PRACTICE SET 5: FUNCTIONS AND GRAPHS

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1. If  $f(x) = 2x + 3$ , what is  $f(4)$ ?

- A. 8
- B. 11
- C. 14
- D. 7

2. What is the slope of the line  $y = 5x - 2$ ?

- A.  $-2$
- B. 2
- C.  $-5$
- D. 5

3. Which point lies on the line  $y = x + 3$ ?

- A. (2, 5)
- B. (3, 3)
- C. (1, 2)
- D. (0, 0)

4. The y-intercept of  $y = 3x - 6$  is:

- A. 3
- B. 6
- C. -6
- D. -3

5. If  $g(x) = x^2$ , what is  $g(-3)$ ?

- A. -9
- B. -6
- C. 6
- D. 9

6. A line passes through  $(0, 4)$  with slope 2. Its equation is:

- A.  $y = 2x + 4$
- B.  $y = 4x + 2$
- C.  $y = 2x - 4$
- D.  $y = -2x + 4$

7. What is the domain of  $f(x) = 1/x$ ?

- A. all real numbers
- B.  $x > 0$
- C.  $x \neq 0$
- D.  $x < 0$

8. If  $f(x) = 3x - 1$  and  $f(a) = 8$ , what is  $a$ ?

A. 2

B. 3

C. 4

D. 5

9. The slope of a vertical line is:

A. 0

B. 1

C.  $-1$

D. undefined

10. If  $h(x) = x + 5$ , what is  $h(2)$ ?

A. 7

B. 3

C. 10

D. 2

11. The line  $y = -x + 6$  has slope:

A. 6

B. 1

C.  $-1$

D.  $-6$

12. If  $f(x) = x^2 + 1$ , what is  $f(0)$ ?

- A. 1
- B. 0
- C. 2
- D. -1

13. Which function is linear?

- A.  $y = x^2$
- B.  $y = 1/x$
- C.  $y = 2^x$
- D.  $y = 3x + 1$

14. The equation of a horizontal line through  $(2, 5)$  is:

- A.  $x = 2$
- B.  $y = 5$
- C.  $y = 2$
- D.  $x = 5$

15. If  $f(x) = 2x^2$  and  $f(a) = 8$ , what is a (positive value)?

- A. 2
- B. 4
- C. 1
- D. 3

16. What is the y-intercept of  $y = 2x + 7$ ?

- A. 2
- B. -7
- C. 0
- D. 7

17. A line has slope 3 and passes through (1, 2). Its equation is:

- A.  $y = 3x + 2$
- B.  $y = 3x - 1$
- C.  $y = 3x + 1$
- D.  $y = 2x + 3$

18. The range of  $f(x) = x^2$  is:

- A. all real numbers
- B.  $y > 0$
- C.  $y \geq 0$
- D.  $y \leq 0$

19. If  $f(x) = 4x - 5$ , what is  $f(-2)$ ?

- A. -13
- B. -3
- C. 3
- D. 13

20. Parallel lines have:

- A. different slopes
- B. perpendicular slopes
- C. reciprocal slopes
- D. equal slopes

21. What is  $f(g(1))$  if  $f(x) = x + 2$  and  $g(x) = 3x$ ?

- A. 3
- B. 4
- C. 6
- D. 5

22. The slope of a line passing through  $(2, 3)$  and  $(4, 7)$  is:

- A. 1
- B. 2
- C. 3
- D. 4

23. The equation  $y = 4$  represents:

- A. a horizontal line
- B. a vertical line
- C. a line through origin
- D. a parabola

24. If  $f(x) = x + 3$  and  $g(x) = 2x$ , what is  $(f + g)(2)$ ?

- A. 4
- B. 6
- C. 9
- D. 12

25. Which is a function?

- A.  $x^2 + y^2 = 1$
- B.  $y^2 = x$
- C.  $x = 3$
- D.  $y = x^3$

26. The y-intercept of  $y = -x - 4$  is:

- A. -4
- B. 4
- C. 1
- D. -1

27. A line perpendicular to  $y = 2x + 1$  has slope:

- A. 2
- B. -2
- C.  $-1/2$
- D.  $1/2$

28. If  $f(x) = 5x$  and  $f(a) = 20$ , then  $a = ?$

- A. 2
- B. 4
- C. 5
- D. 15

29. The graph of  $y = x^2$  is a:

- A. line
- B. circle
- C. square
- D. parabola

30. The domain of  $f(x) = \sqrt{x}$  is:

- A. all real numbers
- B.  $x \geq 0$
- C.  $x > 0$
- D.  $x \leq 0$

31. If  $f(x) = 2x + 1$ , what is  $f(f(1))$ ?

- A. 7
- B. 3
- C. 5
- D. 9

32. The line  $y = -3x + 2$  has y-intercept:

- A.  $-3$
- B.  $3$
- C.  $2$
- D.  $-2$

33. A linear function has constant:

- A. intercept
- B. curvature
- C. domain
- D. rate of change

34. If  $f(x) = x - 4$ , what is  $f(10)$ ?

- A.  $14$
- B.  $6$
- C.  $-4$
- D.  $4$

35. The slope of  $y = 0$  is:

- A.  $0$
- B. undefined
- C.  $1$
- D.  $-1$

36. Which line is parallel to  $y = 2x - 3$ ?

A.  $y = -2x + 1$

B.  $y = x + 2$

C.  $y = 3x - 2$

D.  $y = 2x + 5$

37. The x-intercept of  $y = 2x - 8$  is:

A.  $-4$

B.  $4$

C.  $8$

D.  $-8$

38. If  $f(x) = x^2 - 2x$ , what is  $f(3)$ ?

A.  $1$

B.  $2$

C.  $3$

D.  $6$

39. The function  $f(x) = 2x$  is a(n):

A. linear function

B. quadratic function

C. exponential function

D. rational function

40. A line with slope  $-1$  passing through  $(0, 3)$  is:

A.  $y = x + 3$

B.  $y = 3x - 1$

C.  $y = x - 3$

D.  $y = -x + 3$

41. If  $g(x) = x + 1$  and  $f(x) = 2x$ , what is  $f(g(2))$ ?

A. 3

B. 4

C. 5

D. 6

42. The graph of  $y = 2x + 1$  crosses the x-axis at:

A.  $(-1, 0)$

B.  $(-1/2, 0)$

C.  $(1/2, 0)$

D.  $(1, 0)$

43. If  $f(x) = 3$ , what is  $f(100)$ ?

A. 3

B. 100

C. 103

D. 300

44. What is the slope of the line through (1, 1) and (4, 10)?

- A. 2
- B. 4
- C. 3
- D. 1

45. The function  $y = 1/x$  is undefined at:

- A.  $x = 1$
- B.  $x = -1$
- C.  $x = \text{infinity}$
- D.  $x = 0$

46. If  $f(x) = x^2 + 3$  and  $f(a) = 12$ ,  $a = ?$

- A. 3 or -3
- B. 4
- C. 9
- D. 2

47. A function that passes the vertical line test is a:

- A. relation only
- B. non-function
- C. function
- D. circle

48. The equation of the x-axis is:

A.  $x = 0$

B.  $y = 0$

C.  $y = x$

D.  $x = y$

49. If  $g(x) = 2x^2 - 1$ , what is  $g(2)$ ?

A. 3

B. 5

C. 6

D. 7

50. The slope formula is:

A.  $(y_2 - y_1)/(x_2 - x_1)$

B.  $(x_2 - x_1)/(y_2 - y_1)$

C.  $x_2 - x_1$

D.  $y_2 - y_1$

# PRACTICE SET 5: ANSWER KEY AND EXPLANATIONS

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1. B — 11. Substituting  $x = 4$  into  $f(x) = 2x + 3$  gives  $2(4) + 3 = 8 + 3 = 11$ . Function evaluation replaces the variable with the given input value.
2. D — 5. In slope-intercept form  $y = mx + b$ , the coefficient of  $x$  is the slope. For  $y = 5x - 2$ , the slope is 5.
3. A — (2, 5). Substituting  $x = 2$  into  $y = x + 3$  gives  $y = 5$ , matching the point. A point lies on a line only when its coordinates satisfy the equation.
4. C — -6. The y-intercept in  $y = mx + b$  is the constant  $b$ . For  $y = 3x - 6$ , the y-intercept is -6.
5. D — 9. Substituting  $x = -3$  into  $g(x) = x^2$  gives  $(-3)^2 = 9$ . Squaring a negative always produces a positive result.
6. A —  $y = 2x + 4$ . The slope-intercept form requires slope and y-intercept. With slope 2 and y-intercept 4, the equation is  $y = 2x + 4$ .
7. C —  $x \neq 0$ . The function  $1/x$  is undefined when the denominator equals zero, so the domain excludes  $x = 0$  but includes all other real numbers.
8. B — 3. Setting  $f(a) = 8$  gives  $3a - 1 = 8$ , so  $3a = 9$  and  $a = 3$ . Solving for the input requires reversing the function's operations.
9. D — undefined. Vertical lines have no horizontal change ( $\text{run} = 0$ ), so the slope formula's denominator is zero, making the slope undefined.
10. A — 7. Substituting  $x = 2$  into  $h(x) = x + 5$  gives  $2 + 5 = 7$ .
11. C — -1. In  $y = -x + 6$ , the coefficient of  $x$  is -1, which is the slope. The line falls from left to right.
12. A — 1. Substituting  $x = 0$  into  $f(x) = x^2 + 1$  gives  $0 + 1 = 1$ .
13. D —  $y = 3x + 1$ . A linear function has the form  $y = mx + b$  and produces a straight line. The other options are quadratic, reciprocal, and exponential.
14. B —  $y = 5$ . A horizontal line has a constant y-value equal to the y-coordinate of any point on it. Through (2, 5), the line is  $y = 5$ .
15. A — 2. Setting  $f(a) = 8$  gives  $2a^2 = 8$ , so  $a^2 = 4$  and the positive value is  $a = 2$ .

16. D — 7. The constant  $b$  in  $y = mx + b$  is the  $y$ -intercept, so for  $y = 2x + 7$ ,  $b = 7$ .
17. B —  $y = 3x - 1$ . Using point-slope form  $y - 2 = 3(x - 1)$ , distributing gives  $y - 2 = 3x - 3$ , and adding 2 yields  $y = 3x - 1$ .
18. C —  $y \geq 0$ . Squaring any real number produces a nonnegative result, so the output of  $f(x) = x^2$  is always zero or positive.
19. A —  $-13$ . Substituting  $x = -2$  into  $f(x) = 4x - 5$  gives  $4(-2) - 5 = -8 - 5 = -13$ .
20. D — equal slopes. Parallel lines run in the same direction without intersecting, which requires identical slopes.
21. D — 5. First evaluate  $g(1) = 3(1) = 3$ , then  $f(3) = 3 + 2 = 5$ . Function composition evaluates the inner function first.
22. B — 2. Using the slope formula  $(y_2 - y_1)/(x_2 - x_1) = (7 - 3)/(4 - 2) = 4/2 = 2$ .
23. A — a horizontal line. The equation  $y = 4$  means  $y$  is constantly 4 regardless of  $x$ , producing a horizontal line.
24. C — 9. Evaluating  $f(2) = 2 + 3 = 5$  and  $g(2) = 2(2) = 4$ , then adding gives  $5 + 4 = 9$ .
25. D —  $y = x^3$ . A function passes the vertical line test, and  $y = x^3$  produces a unique  $y$  for every  $x$ . The other options fail this test.
26. A —  $-4$ . The  $y$ -intercept in  $y = -x - 4$  is the constant  $-4$ .
27. C —  $-1/2$ . Perpendicular slopes are negative reciprocals, so the slope perpendicular to 2 is  $-1/2$ .
28. B — 4. Setting  $5a = 20$  gives  $a = 4$ .
29. D — parabola. The graph of  $y = x^2$  is a U-shaped curve called a parabola.
30. B —  $x \geq 0$ . The expression under a square root must be nonnegative for real outputs, so the domain is  $x \geq 0$ .
31. A — 7. First evaluate  $f(1) = 2(1) + 1 = 3$ , then  $f(3) = 2(3) + 1 = 7$ .
32. C — 2. The constant in  $y = -3x + 2$  is the  $y$ -intercept, which is 2.
33. D — rate of change. Linear functions have a constant rate of change, which is the slope.
34. B — 6. Substituting  $x = 10$  into  $f(x) = x - 4$  gives  $10 - 4 = 6$ .
35. A — 0. The equation  $y = 0$  is the  $x$ -axis, a horizontal line with slope 0.
36. D —  $y = 2x + 5$ . Parallel lines share the same slope. Only  $y = 2x + 5$  has a slope of 2 matching the given line.
37. B — 4. The  $x$ -intercept occurs when  $y = 0$ , so  $0 = 2x - 8$  gives  $x = 4$ .

38. C — 3. Substituting  $x = 3$  into  $f(x) = x^2 - 2x$  gives  $9 - 6 = 3$ .
39. A — linear function. The function  $f(x) = 2x$  has the form  $y = mx + b$  with  $b = 0$ , which is a linear function.
40. D —  $y = -x + 3$ . Slope-intercept form with slope  $-1$  and  $y$ -intercept  $3$  gives  $y = -x + 3$ .
41. D — 6. First evaluate  $g(2) = 2 + 1 = 3$ , then  $f(3) = 2(3) = 6$ .
42. B —  $(-1/2, 0)$ . The  $x$ -intercept occurs when  $y = 0$ :  $0 = 2x + 1$  gives  $x = -1/2$ .
43. A — 3. The function  $f(x) = 3$  is constant, so  $f(100) = 3$  regardless of input. Constant functions return the same output for every input.
44. C — 3. Using the slope formula:  $(10 - 1)/(4 - 1) = 9/3 = 3$ .
45. D —  $x = 0$ . The function  $1/x$  has a zero in the denominator when  $x = 0$ , making it undefined there.
46. A — 3 or  $-3$ . Setting  $f(a) = 12$  gives  $a^2 + 3 = 12$ , so  $a^2 = 9$  and  $a = \pm 3$ .
47. C — function. The vertical line test identifies functions — if every vertical line crosses a graph at most once, the graph represents a function.
48. B —  $y = 0$ . The  $x$ -axis is the horizontal line where  $y$  is constantly  $0$ .
49. D — 7. Substituting  $x = 2$  into  $g(x) = 2x^2 - 1$  gives  $2(4) - 1 = 8 - 1 = 7$ .
50. A —  $(y_2 - y_1)/(x_2 - x_1)$ . This is the standard slope formula, calculating vertical change divided by horizontal change between two points.