



ELMALG: Graphing Lines

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Learning Objectives

- Compute the slope of a line from two points
- Identify slope and y-intercept from $y = mx + b$
- Graph a linear equation using slope-intercept form
- Evaluate a linear function at a given input

Simplify each expression completely. Show all steps and circle your final answer.

Evaluating linear functions

1. A line has equation $f(x) = 6x + -5$. Find $f(-3)$.

$$f(x) = 6x - 5, \quad x = -3$$

Answer: _____

2. Given $f(x) = -4x + 1$, find $f(-1)$.

$$f(x) = -4x + 1, \quad x = -1$$

Answer: _____

3. A plumber charges a flat fee of \$63 plus \$66 per hour. Find the total cost for 5 hours.

$$f(x) = 66x + 63, \quad x = 5$$

Answer: _____

4. A line has equation $f(x) = 4x + 0$. Find $f(2)$.

$$f(x) = 4x + 0, \quad x = 2$$

Answer: _____

5. Given $f(x) = -1x + 8$, find $f(5)$.

$$f(x) = -1x + 8, \quad x = 5$$

Answer: _____

6. A plumber charges a flat fee of \$33 plus \$57 per hour. Find the total cost for 5 hours.

$$f(x) = 57x + 33, \quad x = 5$$

Answer: _____

7. A line has equation $f(x) = 5x + -2$. Find $f(0)$.

$$f(x) = 5x - 2, \quad x = 0$$

Answer: _____

8. Given $f(x) = -1x + -6$, find $f(4)$.

$$f(x) = -1x - 6, \quad x = 4$$

Answer: _____

9. A plumber charges a flat fee of \$48 plus \$59 per hour. Find the total cost for 5 hours.

$$f(x) = 59x + 48, \quad x = 5$$

Answer: _____

10. A line has equation $f(x) = 1x + 1$. Find $f(3)$.

$$f(x) = 1x + 1, \quad x = 3$$

Answer: _____

11. Given $f(x) = -3x + -5$, find $f(3)$.

$$f(x) = -3x - 5, \quad x = 3$$

Answer: _____

12. A plumber charges a flat fee of \$59 plus \$87 per hour. Find the total cost for 5 hours.

$$f(x) = 87x + 59, \quad x = 5$$

Answer: _____

Slope from two points

13. Find the slope of the line passing through $(-2, 2)$ and $(2, 0)$.

$$(-2, 2), (2, 0)$$

Answer: _____

14. A road rises 5 feet over a horizontal distance of 2 feet. What is the slope (grade) of the road? Use the two points $(0, 0)$ and $(2, 5)$.

$$(0, 0), (2, 5)$$

Answer: _____

15. A ramp rises from (2, 0) to (7, 5). Find the slope (rate of rise per horizontal unit).

(2, 0), (7, 5)

Answer: _____

16. Find the slope of the line passing through (0, -1) and (4, 1).

(0, -1), (4, 1)

Answer: _____

17. A road rises 3 feet over a horizontal distance of 6 feet. What is the slope (grade) of the road? Use the two points (0, 0) and (6, 3).

(0, 0), (6, 3)

Answer: _____

18. A ramp rises from (0, 1) to (3, 7). Find the slope (rate of rise per horizontal unit).

(0, 1), (3, 7)

Answer: _____

19. Find the slope of the line passing through (-1, -2) and (4, -5).

(-1, -2), (4, -5)

Answer: _____

20. A road rises 2 feet over a horizontal distance of 8 feet. What is the slope (grade) of the road? Use the two points (0, 0) and (8, 2).

(0, 0), (8, 2)

Answer: _____

21. A ramp rises from (3, 3) to (7, 6). Find the slope (rate of rise per horizontal unit).

(3, 3), (7, 6)

Answer: _____

22. Find the slope of the line passing through (1, -4) and (2, 2).

(1, -4), (2, 2)

Answer: _____

23. A road rises 4 feet over a horizontal distance of 7 feet. What is the slope (grade) of the road? Use the two points (0, 0) and (7, 4).

$$(0, 0), (7, 4)$$

Answer: _____

24. A ramp rises from (2, 4) to (8, 5). Find the slope (rate of rise per horizontal unit).

$$(2, 4), (8, 5)$$

Answer: _____

Slope-intercept form

25. Identify the slope and y-intercept of the line $y = 3x + 2$.

$$y = 3x + 2$$

Answer: _____

26. A line has equation $y = -3x + -1$. What is the slope? What is the y-intercept? Plot the y-intercept and use the slope to find a second point.

$$y = -3x - 1$$

Answer: _____

27. Identify the slope and y-intercept of the line $y = 3x + -8$.

$$y = 3x - 8$$

Answer: _____

28. A line has equation $y = -4x + -1$. What is the slope? What is the y-intercept? Plot the y-intercept and use the slope to find a second point.

$$y = -4x - 1$$

Answer: _____

29. Identify the slope and y-intercept of the line $y = 2x + -5$.

$$y = 2x - 5$$

Answer: _____

30. A line has equation $y = 2x + -2$. What is the slope? What is the y-intercept? Plot the y-intercept and use the slope to find a second point.

$$y = 2x - 2$$

Answer: _____



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ANSWER KEY & SOLUTIONS

Topics: Slope from two points, Evaluating linear functions, Slope-intercept form. All answers verified by independent computation.

Solutions

Evaluating linear functions

1. A line has equation $f(x) = 6x + -5$. Find $f(-3)$.

$$f(x) = 6x - 5, \quad x = -3$$

$$\rightarrow f(-3) = 6(-3) + -5 = -18 + -5 = -23.$$

Answer: $f(-3) = -23$

2. Given $f(x) = -4x + 1$, find $f(-1)$.

$$f(x) = -4x + 1, \quad x = -1$$

$$\rightarrow \text{Substitute } x = -1: f(-1) = -4(-1) + 1.$$

$$\rightarrow = 4 + 1 = 5.$$

Answer: $f(-1) = 5$

3. A plumber charges a flat fee of \$63 plus \$66 per hour. Find the total cost for 5 hours.

$$f(x) = 66x + 63, \quad x = 5$$

$$\rightarrow C(h) = 66h + 63.$$

$$\rightarrow C(5) = 66(5) + 63 = 330 + 63 = \$393.$$

Answer: $f(5) = 393$

4. A line has equation $f(x) = 4x + 0$. Find $f(2)$.

$$f(x) = 4x + 0, \quad x = 2$$

$$\rightarrow f(2) = 4(2) + 0 = 8 + 0 = 8.$$

Answer: $f(2) = 8$

5. Given $f(x) = -1x + 8$, find $f(5)$.

$$f(x) = -1x + 8, \quad x = 5$$

$$\rightarrow \text{Substitute } x = 5: f(5) = -1(5) + 8.$$

$$\rightarrow = -5 + 8 = 3.$$

Answer: $f(5) = 3$

6. A plumber charges a flat fee of \$33 plus \$57 per hour. Find the total cost for 5 hours.

$$f(x) = 57x + 33, \quad x = 5$$

$$\rightarrow C(h) = 57h + 33.$$

$$\rightarrow C(5) = 57(5) + 33 = 285 + 33 = \$318.$$

Answer: $f(5) = 318$

7. A line has equation $f(x) = 5x + -2$. Find $f(0)$.

$$f(x) = 5x - 2, \quad x = 0$$

$$\rightarrow f(0) = 5(0) + -2 = 0 + -2 = -2.$$

Answer: $f(0) = -2$

8. Given $f(x) = -1x + -6$, find $f(4)$.

$$f(x) = -1x - 6, \quad x = 4$$

$$\rightarrow \text{Substitute } x = 4: f(4) = -1(4) + -6.$$

$$\rightarrow = -4 + -6 = -10.$$

Answer: $f(4) = -10$

9. A plumber charges a flat fee of \$48 plus \$59 per hour. Find the total cost for 5 hours.

$$f(x) = 59x + 48, \quad x = 5$$

$$\rightarrow C(h) = 59h + 48.$$

$$\rightarrow C(5) = 59(5) + 48 = 295 + 48 = \$343.$$

Answer: $f(5) = 343$

10. A line has equation $f(x) = 1x + 1$. Find $f(3)$.

$$f(x) = 1x + 1, \quad x = 3$$

$$\rightarrow f(3) = 1(3) + 1 = 3 + 1 = 4.$$

Answer: $f(3) = 4$

11. Given $f(x) = -3x + -5$, find $f(3)$.

$$f(x) = -3x - 5, \quad x = 3$$

$$\rightarrow \text{Substitute } x = 3: f(3) = -3(3) + -5.$$

$$\rightarrow = -9 + -5 = -14.$$

Answer: $f(3) = -14$

12. A plumber charges a flat fee of \$59 plus \$87 per hour. Find the total cost for 5 hours.

$$f(x) = 87x + 59, \quad x = 5$$

$$\rightarrow C(h) = 87h + 59.$$

$$\rightarrow C(5) = 87(5) + 59 = 435 + 59 = \$494.$$

Answer: $f(5) = 494$

Slope from two points

13. Find the slope of the line passing through (-2, 2) and (2, 0).

$$(-2, 2), (2, 0)$$

$$\rightarrow m = (y_2 - y_1)/(x_2 - x_1) = -2/4 = -1/2.$$

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{-2}{4} = -1/2$

14. A road rises 5 feet over a horizontal distance of 2 feet. What is the slope (grade) of the road? Use the two points (0, 0) and (2, 5).

$$(0, 0), (2, 5)$$

$$\rightarrow \text{Slope} = \text{rise/run} = 5/2 = 5/2.$$

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{5}{2} = 5/2$

15. A ramp rises from (2, 0) to (7, 5). Find the slope (rate of rise per horizontal unit).

$$(2, 0), (7, 5)$$

$$\rightarrow \text{slope} = \text{rise} / \text{run} = (5 - 0) / (7 - 2) = 5 / 5.$$

$$\rightarrow \text{Slope} = 1.$$

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{5}{5} = 1$

16. Find the slope of the line passing through (0, -1) and (4, 1).

$$(0, -1), (4, 1)$$

$$\rightarrow m = (y_2 - y_1)/(x_2 - x_1) = 2/4 = 1/2.$$

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{2}{4} = 1/2$

17. A road rises 3 feet over a horizontal distance of 6 feet. What is the slope (grade) of the road? Use the two points (0, 0) and (6, 3).

$$(0, 0), (6, 3)$$

$$\rightarrow \text{Slope} = \text{rise/run} = 3/6 = 1/2.$$

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{3}{6} = 1/2$

18. A ramp rises from (0, 1) to (3, 7). Find the slope (rate of rise per horizontal unit).

$$(0, 1), (3, 7)$$

$$\rightarrow \text{slope} = \text{rise} / \text{run} = (7 - 1) / (3 - 0) = 6 / 3.$$

$$\rightarrow \text{Slope} = 2.$$

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{6}{3} = 2$

19. Find the slope of the line passing through (-1, -2) and (4, -5).

$$(-1, -2), (4, -5)$$

$$\rightarrow m = (y_2 - y_1)/(x_2 - x_1) = -3/5 = -3/5.$$

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{-3}{5} = -3/5$

20. A road rises 2 feet over a horizontal distance of 8 feet. What is the slope (grade) of the road? Use the two points (0, 0) and (8, 2).

$$(0, 0), (8, 2)$$

$$\rightarrow \text{Slope} = \text{rise/run} = 2/8 = 1/4.$$

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{2}{8} = 1/4$

21. A ramp rises from (3, 3) to (7, 6). Find the slope (rate of rise per horizontal unit).

$$(3, 3), (7, 6)$$

$$\rightarrow \text{slope} = \text{rise} / \text{run} = (6 - 3) / (7 - 3) = 3 / 4.$$

$$\rightarrow \text{Slope} = 3/4.$$

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{3}{4} = 3/4$

22. Find the slope of the line passing through (1, -4) and (2, 2).

$$(1, -4), (2, 2)$$

$$\rightarrow m = (y_2 - y_1)/(x_2 - x_1) = 6/1 = 6.$$

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{6}{1} = 6$

23. A road rises 4 feet over a horizontal distance of 7 feet. What is the slope (grade) of the road? Use the two points (0, 0) and (7, 4).

$$(0, 0), (7, 4)$$

$$\rightarrow \text{Slope} = \text{rise/run} = 4/7 = 4/7.$$

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{4}{7} = 4/7$

24. A ramp rises from (2, 4) to (8, 5). Find the slope (rate of rise per horizontal unit).

$$(2, 4), (8, 5)$$

$$\rightarrow \text{slope} = \text{rise} / \text{run} = (5 - 4) / (8 - 2) = 1 / 6.$$

$$\rightarrow \text{Slope} = 1/6.$$

Answer: $m = \frac{\Delta y}{\Delta x} = \frac{1}{6} = 1/6$

Slope-intercept form

25. Identify the slope and y-intercept of the line $y = 3x + 2$.

$$y = 3x + 2$$

→ The equation is in slope-intercept form $y = mx + b$.

→ Slope $m = 3$. Y-intercept $b = 2$ (the point $(0, 2)$).

Answer: slope = 3, y-int = 2

26. A line has equation $y = -3x + -1$. What is the slope? What is the y-intercept? Plot the y-intercept and use the slope to find a second point.

$$y = -3x - 1$$

→ Slope = -3 (rise over run: move -3 units up for every 1 unit right).

→ Y-intercept = -1. Plot $(0, -1)$ first, then use the slope to plot a second point.

Answer: slope = -3, y-int = -1

27. Identify the slope and y-intercept of the line $y = 3x + -8$.

$$y = 3x - 8$$

→ The equation is in slope-intercept form $y = mx + b$.

→ Slope $m = 3$. Y-intercept $b = -8$ (the point $(0, -8)$).

Answer: slope = 3, y-int = -8

28. A line has equation $y = -4x + -1$. What is the slope? What is the y-intercept? Plot the y-intercept and use the slope to find a second point.

$$y = -4x - 1$$

→ Slope = -4 (rise over run: move -4 units up for every 1 unit right).

→ Y-intercept = -1. Plot $(0, -1)$ first, then use the slope to plot a second point.

Answer: slope = -4, y-int = -1

29. Identify the slope and y-intercept of the line $y = 2x + -5$.

$$y = 2x - 5$$

→ The equation is in slope-intercept form $y = mx + b$.

→ Slope $m = 2$. Y-intercept $b = -5$ (the point $(0, -5)$).

Answer: slope = 2, y-int = -5

30. A line has equation $y = 2x + -2$. What is the slope? What is the y-intercept? Plot the y-intercept and use the slope to find a second point.

$$y = 2x - 2$$

→ Slope = 2 (rise over run: move 2 units up for every 1 unit right).

→ Y-intercept = -2. Plot $(0, -2)$ first, then use the slope to plot a second point.

Answer: slope = 2, y-int = -2
