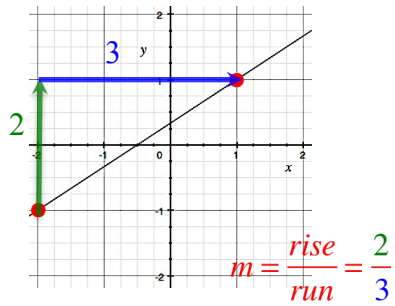


3.4 Geometric Characteristics of Lines

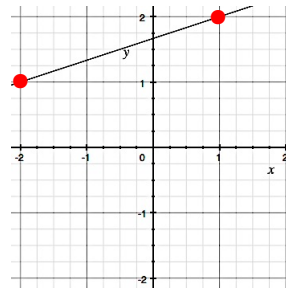
Solutions

Determine the slope of each line.

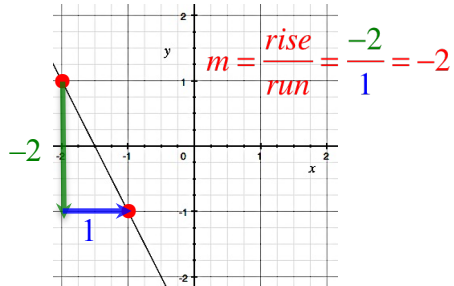
1.



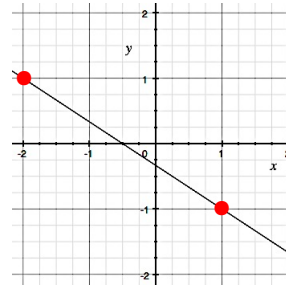
2.



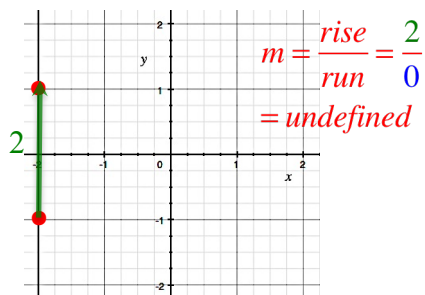
3.



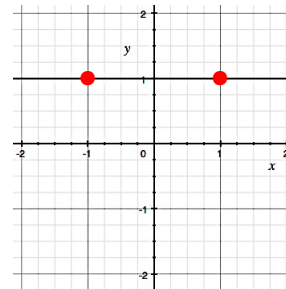
4.



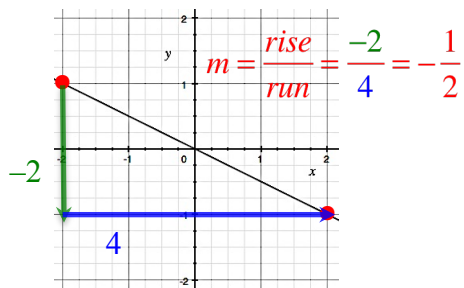
5.



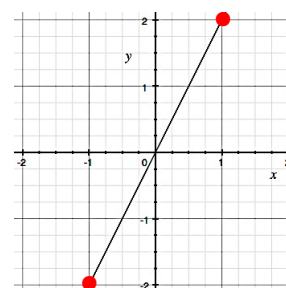
6.



7.

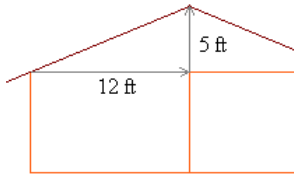


8.



Answers: 1. $\frac{2}{3}$; 3. -2 ; 5. undefined; 7. $-\frac{1}{2}$

9. The roof “pitch” that builders refer to is the same as the slope of the roof. Find the slope of the roof in the drawing.



$$m = \frac{\text{rise}}{\text{run}} = \frac{5}{12}$$

10. A road on a hill slopes down as shown below. What is the numerical slope associated with this hill?



Determine the slope of the line that passes through each pair of points.

11. (3, 4) and (5, 9)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{9 - 4}{5 - 3} = \frac{5}{2}$$

12. (0, 8) and (3, 4)

13. (2, -1) and (5, -1)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - (-1)}{5 - 2} = \frac{0}{3} = 0$$

14. (-3, 4) and (4, 4)

15. (3, 4) and (3, -9)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-9 - 4}{3 - 3} = \frac{-13}{0}$$

= undefined

16. (-5, 4) and (-5, 0)

17. (1, 4) and (3, 2)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 4}{3 - 1} = \frac{-2}{2} = -1$$

18. (5, 2) and (8, 8)

Answers: **9.** $m = \frac{5}{12}$; **11.** $m = \frac{5}{2}$; **13.** $m = 0$; **15.** slope is undefined; **17.** $m = -1$

<p>19. During the year 2007, a Honda dealer sold 15 Civic-hybrid cars. In the following years, demand for hybrid cars increased, and in 2012, the same dealer sold 100 Civic-hybrid cars.</p> <p>(a) Find the slope of the line through the points (2007, 15) and (2012, 100).</p> $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{100 - 15}{2012 - 2007} = \frac{85}{5} = 17$ <p>(b) What is the rate of increase in Civic-hybrid sales per year?</p> <p style="text-align: center;">17 cars per year</p>	<p>20. A small company produced 685 picnic tables in 2011. By the year 2013 it produced 1321 picnic tables.</p> <p>(a) Find the slope of the line through the points (2011, 685) and (2013, 1321).</p> <p>(b) What is the rate of increase in picnic table production per year?</p>
<p>Determine the slope and the y-intercept of each equation.</p>	
<p>21. $y = \frac{2}{3}x + 5$ $y = mx + b$</p> <p style="text-align: center;">$m = \frac{2}{3}$ and $b = 5$</p>	<p>22. $y = -5x + 2$</p>
<p>23. $2x + 6y = 12$</p> $\begin{array}{r} 2x + 6y = 0x + 12 \\ \underline{-2x} \quad \underline{-2x} \\ 6y = -2x + 12 \\ y = -\frac{2}{6}x + 2 \\ m = -\frac{1}{3} \text{ and } b = 2 \end{array}$	<p>24. $4x + 3y = 6$</p>
<p>25. $\frac{6y}{6} = \frac{12x}{6}$</p> $\begin{array}{l} y = 2x + 0 \\ m = 2 \text{ and } b = 0 \end{array}$	<p>26. $2y = -8x$</p>
<p>27. $y = 15$</p> $\begin{array}{l} y = 0x + 15 \\ m = 0 \text{ and } b = 15 \end{array}$	<p>28. $y = -2$</p>
<p>Answers: 19. (a) $m = 17$, (b) 17; 21. $m = \frac{2}{3}$, $b = 5$; 23. $m = -\frac{1}{3}$, $b = 2$; 25. $m = 2$, $b = 0$; 27. $m = 0$, $b = 15$</p>	

Determine whether the following pairs of lines are parallel, perpendicular, or neither.	
<p>29. $y = -5x + 1$ and $y = \frac{1}{5}x + 12$</p> $m_{\perp} = -\frac{1}{m} \quad m = -5, m_{\perp} = -\frac{1}{-5} = \frac{1}{5}$ <p>Slopes are negative reciprocals to each other.</p> <p style="text-align: center;">perpendicular</p>	<p>30. $y = \frac{1}{2}x + 5$ and $y = -2x - 2$</p>
<p>31. $y = -3x - 10$ and $y = 3x + 2$</p> $m_{\perp} = -\frac{1}{m} \quad m = -3, m_{\perp} = -\frac{1}{-3} = \frac{1}{3}$ <p>Slopes are not negative reciprocals to each other.</p> <p style="text-align: center;">neither</p>	<p>32. $y = 4x - 5$ and $y = -4x - 4$</p>
<p>33. $y = 2x$ and $y = 2x + 12$</p> <p style="text-align: center;">Slopes are the same.</p> <p style="text-align: center;">parallel</p>	<p>34. $y = -3x - 4$ and $y = -3x$</p>
<p>35. $y = 15$ and $x = 12$</p> <p>$y = 15$ is a horizontal line $x = 12$ is a vertical line</p> <p style="text-align: center;">perpendicular</p>	<p>36. $x = -5$ and $y = 1$</p>
<p>Answers: 29. perpendicular; 31. neither; 33. parallel; 35. perpendicular</p>	