

# CHAPTER 2

## Functions and Their Graphs

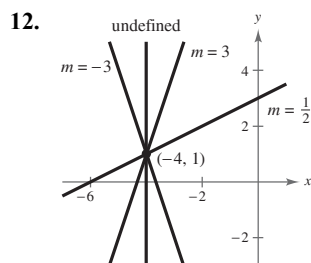
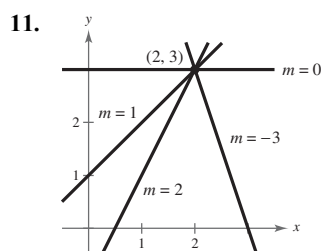
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# CHAPTER 2

## Functions and Their Graphs

### Section 2.1 Linear Equations in Two Variables

- linear
- slope
- point-slope
- parallel
- perpendicular
- rate or rate of change
- linear extrapolation
- general
- (a)  $m = \frac{2}{3}$ . Because the slope is positive, the line rises.  
Matches  $L_2$ .  
(b)  $m$  is undefined. The line is vertical. Matches  $L_3$ .  
(c)  $m = -2$ . The line falls. Matches  $L_1$ .
- (a)  $m = 0$ . The line is horizontal. Matches  $L_2$ .  
(b)  $m = -\frac{3}{4}$ . Because the slope is negative, the line falls. Matches  $L_1$ .  
(c)  $m = 1$ . Because the slope is positive, the line rises. Matches  $L_3$ .



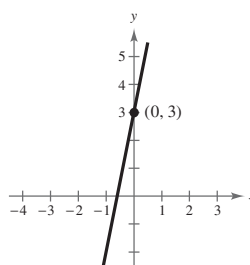
13. Two points on the line: (0, 0) and (4, 6)

$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6}{4} = \frac{3}{2}$$

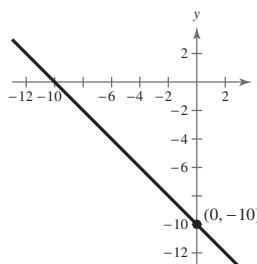
14. The line appears to go through (0, 7) and (7, 0).

$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - 7}{7 - 0} = -1$$

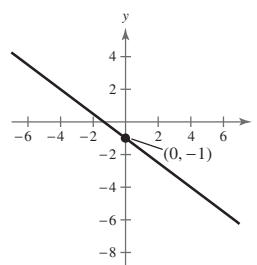
15.  $y = 5x + 3$   
Slope:  $m = 5$   
 $y$ -intercept: (0, 3)



16. Slope:  $m = -1$   
 $y$ -intercept: (0, -10)



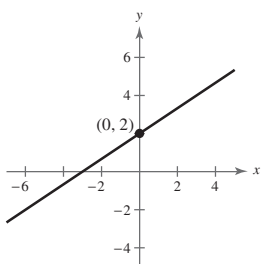
17.  $y = -\frac{3}{4}x - 1$   
Slope:  $m = -\frac{3}{4}$   
 $y$ -intercept: (0, -1)



18.  $y = \frac{2}{3}x + 2$

Slope:  $m = \frac{2}{3}$

y-intercept: (0, 2)

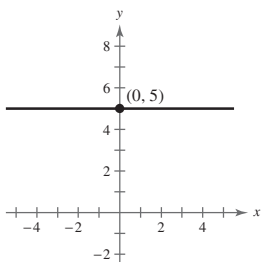


19.  $y - 5 = 0$

$y = 5$

Slope:  $m = 0$

y-intercept: (0, 5)

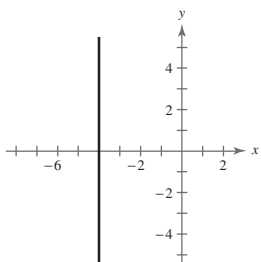


20.  $x + 4 = 0$

$x = -4$

Slope: undefined (vertical line)

y-intercept: none

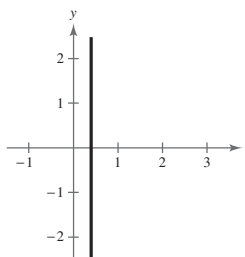


21.  $5x - 2 = 0$

$x = \frac{2}{5}$ , vertical line

Slope: undefined

y-intercept: none



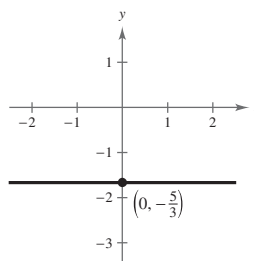
22.  $3y + 5 = 0$

$3y = -5$

$y = -\frac{5}{3}$

Slope:  $m = 0$

y-intercept:  $(0, -\frac{5}{3})$



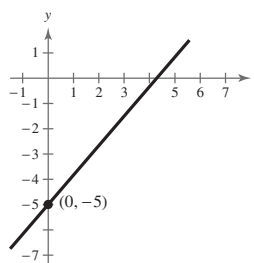
23.  $7x - 6y = 30$

$-6y = -7x + 30$

$y = \frac{7}{6}x - 5$

Slope:  $m = \frac{7}{6}$

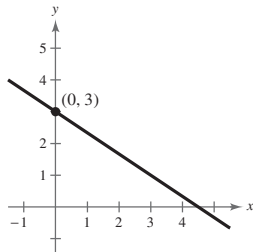
y-intercept: (0, -5)



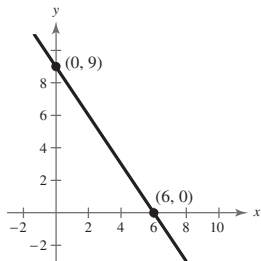
24.  $2x + 3y = 9$   
 $3y = -2x + 9$   
 $y = -\frac{2}{3}x + 3$

Slope:  $m = -\frac{2}{3}$

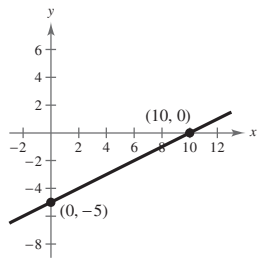
y-intercept:  $(0, 3)$



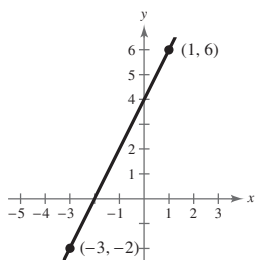
25.  $m = \frac{0 - 9}{6 - 0} = \frac{-9}{6} = -\frac{3}{2}$



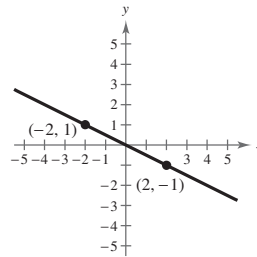
26.  $m = \frac{-5 - 0}{0 - 10} = \frac{-5}{-10} = \frac{1}{2}$



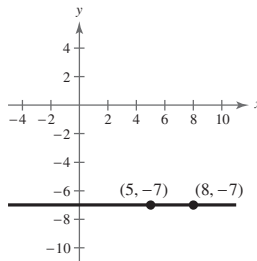
27.  $m = \frac{6 - (-2)}{1 - (-3)} = \frac{8}{4} = 2$



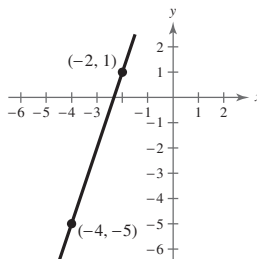
28.  $m = \frac{1 - (-1)}{-2 - 2} = \frac{2}{-4} = -\frac{1}{2}$



29.  $m = \frac{-7 - (-7)}{8 - 5} = \frac{0}{3} = 0$

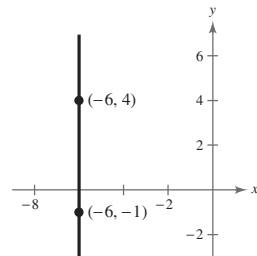


30.  $m = \frac{-5 - 1}{-4 - (-2)} = 3$

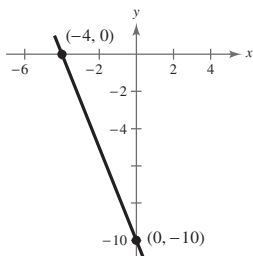


31.  $m = \frac{4 - (-1)}{-6 - (-6)} = \frac{5}{0}$

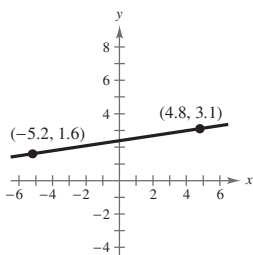
$m$  is undefined.



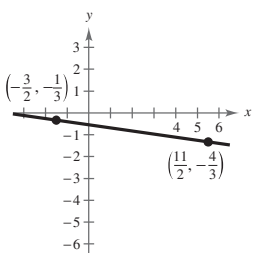
32.  $m = \frac{0 - (-10)}{-4 - 0} = -\frac{5}{2}$



33.  $m = \frac{1.6 - 3.1}{-5.2 - 4.8} = \frac{-1.5}{-10} = 0.15$



34.  $m = \frac{\frac{1}{3} - \left(-\frac{4}{3}\right)}{\frac{3}{2} - \frac{11}{2}} = -\frac{1}{7}$



35. Point:  $(5, 7)$ , Slope:  $m = 0$

Because  $m = 0$ ,  $y$  does not change. Three other points are  $(-1, 7)$ ,  $(0, 7)$ , and  $(4, 7)$ .

36. Point:  $(3, -2)$ , Slope:  $m = 0$

Because  $m = 0$ ,  $y$  does not change. Three other points are  $(1, -2)$ ,  $(10, -2)$ , and  $(-6, -2)$ .

37. Point:  $(-5, 4)$ , Slope:  $m = 2$

Because  $m = 2 = \frac{2}{1}$ ,  $y$  increases by 2 for every one unit increase in  $x$ . Three additional points are  $(-4, 6)$ ,  $(-3, 8)$ , and  $(-2, 10)$ .

38. Point:  $(0, -9)$ , Slope:  $m = -2$

Because  $m = -2$ ,  $y$  decreases by 2 for every one unit increase in  $x$ . Three other points are  $(-2, -5)$ ,  $(1, -11)$ , and  $(3, -15)$ .

39. Point:  $(4, 5)$ , Slope:  $m = -\frac{1}{3}$

Because  $m = -\frac{1}{3}$ ,  $y$  decreases by 1 unit for every three unit increase in  $x$ . Three additional points are  $(-2, 7)$ ,  $(0, -\frac{19}{4})$ , and  $(1, 6)$ .

40. Point:  $(3, -4)$ , Slope:  $m = \frac{1}{4}$

Because  $m = \frac{1}{4}$ ,  $y$  increases by 1 unit for every four unit increase in  $x$ . Three additional points are  $(-1, -5)$ ,  $(1, -11)$ , and  $(3, -15)$ .

41. Point:  $(-4, 3)$ , Slope is undefined.

Because  $m$  is undefined,  $x$  does not change. Three points are  $(-4, 0)$ ,  $(-4, 5)$ , and  $(-4, 2)$ .

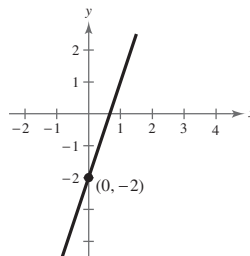
42. Point:  $(2, 14)$ , Slope is undefined.

Because  $m$  is undefined,  $x$  does not change. Three other points are  $(2, -3)$ ,  $(2, 0)$ , and  $(2, 4)$ .

43. Point:  $(0, -2)$ ;  $m = 3$

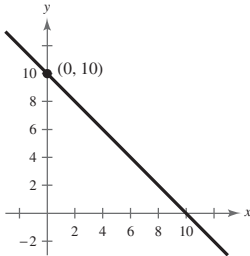
$$y + 2 = 3(x - 0)$$

$$y = 3x - 2$$



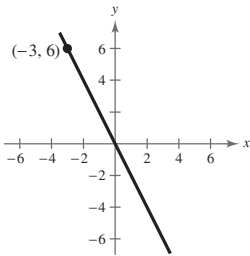
44. Point:  $(0, 10)$ ;  $m = -1$

$$\begin{aligned} y - 10 &= -1(x - 0) \\ y - 10 &= -x \\ y &= -x + 10 \end{aligned}$$



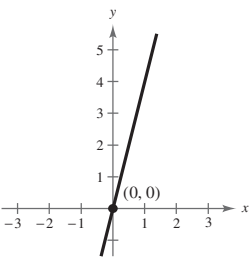
45. Point:  $(-3, 6)$ ;  $m = -2$

$$\begin{aligned} y - 6 &= -2(x + 3) \\ y &= -2x \end{aligned}$$



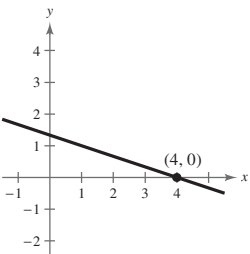
46. Point:  $(0, 0)$ ;  $m = 4$

$$\begin{aligned} y - 0 &= 4(x - 0) \\ y &= 4x \end{aligned}$$



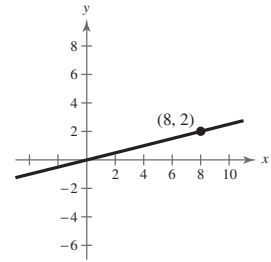
47. Point:  $(4, 0)$ ;  $m = -\frac{1}{3}$

$$\begin{aligned} y - 0 &= -\frac{1}{3}(x - 4) \\ y &= -\frac{1}{3}x + \frac{4}{3} \end{aligned}$$



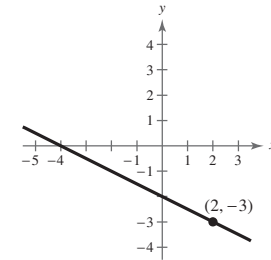
48. Point:  $(8, 2)$ ;  $m = \frac{1}{4}$

$$\begin{aligned} y - 2 &= \frac{1}{4}(x - 8) \\ y - 2 &= \frac{1}{4}x - 2 \\ y &= \frac{1}{4}x \end{aligned}$$



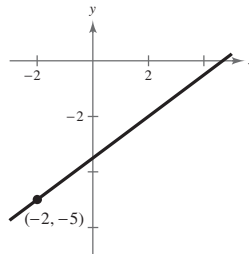
49. Point:  $(2, -3)$ ;  $m = -\frac{1}{2}$

$$\begin{aligned} y - (-3) &= -\frac{1}{2}(x - 2) \\ y + 3 &= -\frac{1}{2}x + 1 \\ y &= -\frac{1}{2}x - 2 \end{aligned}$$



50. Point:  $(-2, -5)$ ;  $m = \frac{3}{4}$

$$\begin{aligned} y + 5 &= \frac{3}{4}(x + 2) \\ 4y + 20 &= 3x + 6 \\ 4y &= 3x - 14 \\ y &= \frac{3}{4}x - \frac{7}{2} \end{aligned}$$



51. Point:  $(4, \frac{5}{2})$ ;  $m = 0$

$$\begin{aligned} y - \frac{5}{2} &= 0(x - 4) \\ y - \frac{5}{2} &= 0 \\ y &= \frac{5}{2} \end{aligned}$$

