4 a) $m = -4$

c) $m = 1$

e) $m = \frac{4}{7}$

Get answers/work on the board

5a) $y = -5x - 18$

$y - y_1 = m(x - x_1)$

$y - 2 = -5(x + 4)$

c) $y = -\frac{3}{4}x + \frac{1}{4}$

$y - 5 = \frac{-3}{4}(x - 7)$

9 i) . n graph)

$$y = -\frac{4}{3}x + \frac{4}{3}$$

ii) $m = \frac{2}{5}$

$$y = \frac{2}{5}x + \frac{9}{5}$$

11b) $(-4, 7)$ with $x_1 = -4$, $y_1 = 7$

$(5, -2)$ with $x_2 = 5$, $y_2 = -2$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2-7}{5+4} = \frac{-9}{9}$$

$$m = -1$$

$$y - y_1 = m(x - x_1)$$

$$y - 7 = -1(x + 4)$$

$$y - 7 = -1x - 4$$

$$+7 \qquad\qquad +7$$

$$y = -1x + 3$$

9) $(-1, -4)$ $(2, 0)$

$x_1 \; y_1$ / $x_2 \; y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{0 + +4}{2 + +1} = \frac{4}{3}$

$3(y - 0) = \frac{4}{3}(x - 2)$

$\frac{3y}{3} - 0 = \frac{4x}{3} - \frac{8}{3}$

$y = \frac{4}{3}x - \frac{8}{3}$

$x_1 \; y_1$

$(4, 1)$

$(-4, 7)$

$x_2 \; y_2$

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$

$m = \dfrac{7 - 1}{-4 + -4} = \dfrac{6}{-8} = \dfrac{3}{-4}$

$-\dfrac{3}{4} = \dfrac{3}{-4} = \dfrac{-3}{4}$

$y - y_1 = m(x - x_1)$

$4(y - 1) = -\dfrac{3}{4}(x - 4)$

$4y - 4 = -3x + 12$

$\quad +4 \qquad\qquad +4$

$\dfrac{4y}{4} = \dfrac{-3x}{4} + \dfrac{16}{4}$

$y = \dfrac{-3}{4}x + 4$

Lesson

Writing the equation of a Line Parallel / Perpendicular to Another Line

Ways of Writing Final Answer:

Slope Y- intercept Form $y=mx + b$

Standard Form $Ax + By = C$

General Form $Ax+By+C =0$

x_1, y_1 $(4, 5)$ $m = -\frac{1}{5}$

$(9, 4)$ $x_2\ y_2$

Steps:

1. Find m. Use ________
2. Find one point.
3. Substitute into
   $y - y_1 = m(x - x_1)$
4. Expand brackets.
5. Get into $y=mx+b$ for

m $y - y_1 = m(x - x_1)$

$y - 5 = -\frac{1}{5}(x - 4)$

$5(y-5) = 5\left(-\frac{1}{5}\right)(x-4)$

$5y - 25 = -1x + 4$ $+25$ $+25$

$\frac{5y}{5} = -\frac{1x}{5} + \frac{29}{5}$

$y = -\frac{1}{5}x + \frac{29}{5}$

Ex 1 Are these lines parallel, perpendicular or neither ?

A. y=2x +4, y=3x-4 neither

B. y= 3x -1, y = 3x +7 //

C. y=1/2 x+7 , y= 2x -5 neither

D. y=2/3x , y = -3/2 x +9 ⊥

CHECK YOUR UNDERSTANDING

SOLUTION

6.5 Slope-Point Form of the Equation for a Linear Function

2. Find an equation of a line in slope y-intercept form parallel to y=2x-5 and through the point (1,-5)

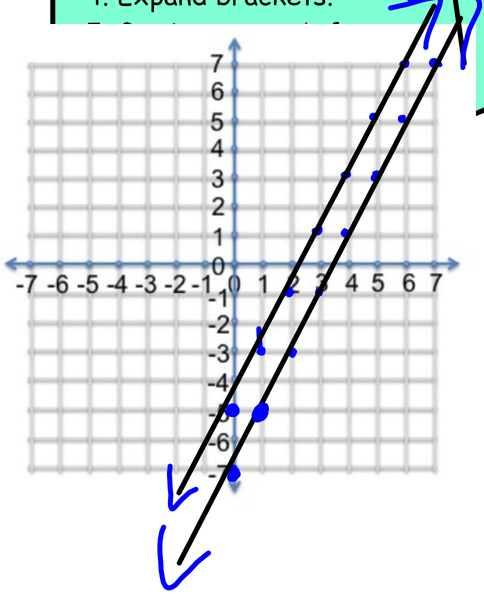
$y=$

x_1, y_1

$m=2 \quad m_{\parallel}=2$

Steps:
1. Find m. Use ____________
2. Find one point.
3. Substitute into
   $y-y_1 = m(x-x_1)$
4. Expand brackets.

$$y-y_1=m(x-x_1)$$
$$y+5=2(x-1)$$
$$y+5-5=2x-2-5$$
$$y=2x-7$$



3. Find an equation of a line in slope y-intercept form perpendicular to y=2x-5 and through the point (1,-5)

$m = 2$ $\quad m_1 = -\frac{1}{2}$

$y - y_1 = m(x - x_1)$

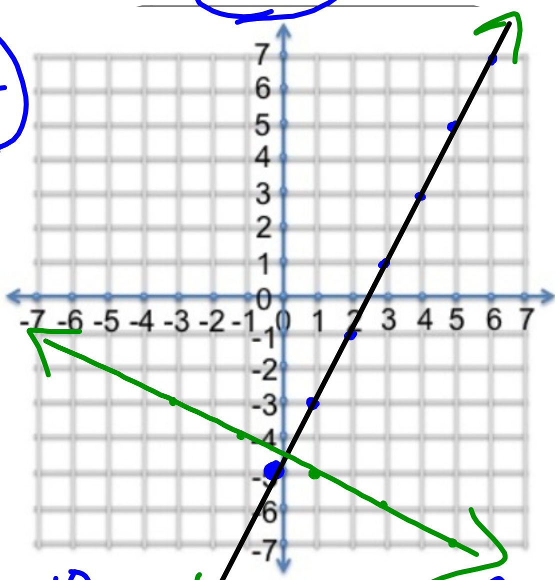
$(y + 5) = -\frac{1}{2}(x - 1)$

$2(y + 5) = -1(x - 1)$

$2y + 10 = -1x + 1$

$2y = -1x - 9$

$y = -\frac{1}{2}x - \frac{9}{2}$



4. Find an equation of a line in general form parallel to 2x+ 3y = 6 passing through the point (3,4).

= 0

① Get m

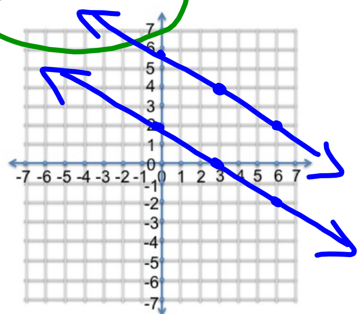
$2x + 3y = 6$

$-2x \quad -2x$

$\frac{3y}{3} = \frac{-2x}{3} + \frac{6}{3}$

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

$m_{\parallel} = \frac{-2}{3}$



$y - y_1 = m(x - x_1)$

$3(y - 4) = \frac{-2}{3}(x - 3)$

$3y - 12 = -2x + 6$

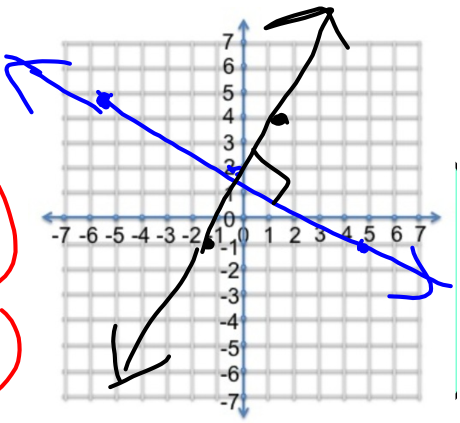
$+2x - 6 \quad = +2x - 6$

$2x + 3y - 18 = 0$

5. Find an equation of a line that is perpendicular to $y = \frac{-3x}{5} + 2$

and passing through the point (2, 4) Write your answer in standard form.

$m_\perp = \frac{5}{3}$ $(2, 4)$ x_1, y_1



$y - y_1 = m(x - x_1)$

$3(y - 4) = 3 \cdot \frac{5}{3}(x - 2)$

$3y - 12 = 5x - 10$

$+12 \qquad +12$

$3y = 5x + 2$

$-5x \qquad -5x$

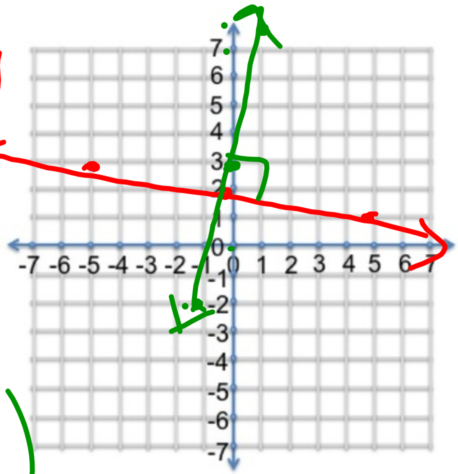
$-5x + 3y = 2$

$\overline{-1} \quad \overline{-1} \quad \overline{-1}$

$5x - 3y = -2$

6. Write the equation of a line in general form that is perpendicular to $y = \frac{-1}{5}x + 2$ and has a y-intercept of 3.

$m = -\frac{1}{5}$ $m_{\perp} = 5$



$\frac{5\uparrow}{1\rightarrow}$

(0,3)

$y - y_1 = m(x - x_1)$

$y - 3 = 5(x - 0)$

$y - 3 = 5x$

$-5x \quad\quad -5x$

$\frac{-5x + y - 3}{-1} = \frac{0}{-1}$

$5x - y + 3 = 0$

Homework- full solutions will be posted

~~Page 364, #21~~

pages 373-374

21(answer slope y-intercept form)

20i,ii (answer standard form)

23a (answer general form)

Page 384

#4,6, 8a Early review assignments..tmm

...Assignments Due ~~Wednesday~~ Tuesday

End of lesson

Discuss the Ideas

1. How does the fact that the slope of a line is constant lead to the slope-point form of the equation of a line?
2. How can you use the slope-point form of the equation of a line to sketch a graph of the line?
3. How can you determine the slope-point form of the equation of a line given a graph of the line?

Activate Prior Learning:
Operations with Rational Numbers

To add or subtract two rational numbers, use equivalent fractions that have like denominators.

To multiply two rational numbers, multiply the numerator and multiply the denominator. We do not need a common denominator.

Simplify.

a) $\frac{3}{4} + 2$

b) $\left(\frac{5}{4}\right)\left(\frac{3}{4}\right)$

6.5 Slope-Point Form of the Equation for a Linear Function

Example 1 Graphing a Linear Function Given Its Equation in Slope-Point Form

a) Describe the graph of the linear function with this equation:

$$y - 2 = \frac{1}{3}(x + 4)$$

b) Graph the equation.

SOLUTION

a) Compare the given equation with the equation in slope-point form.

$$y - y_1 = m(x - x_1)$$

$$y - 2 = \frac{1}{3}(x + 4)$$

To match the slope-point form, rewrite the given equation so the operations are subtraction.

$$y - 2 = \frac{1}{3}[x - (-4)]$$

$$y - y_1 = m(x - x_1)$$

So, $y_1 = 2$

$m = \frac{1}{3}$

$x_1 = -4$

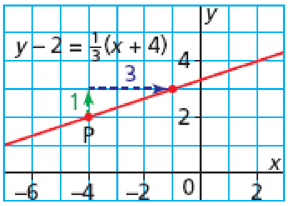
The graph passes through $(-4, 2)$ and has slope $\frac{1}{3}$.

(Solution continues.)

6.5 Slope-Point Form of the Equation for a Linear Function

Example 1 Graphing a Linear Function Given Its Equation in Slope-Point Form

b) Plot the point P(−4, 2) on a grid and use the slope of $\frac{1}{3}$ to plot another point. Draw a line through the points.



CHECK YOUR UNDERSTANDING

6.5 Slope-Point Form of the Equation for a Linear Function

Example 2 Writing an Equation Using a Point on the Line and Its Slope

a) Write an equation in slope-point form for this line.

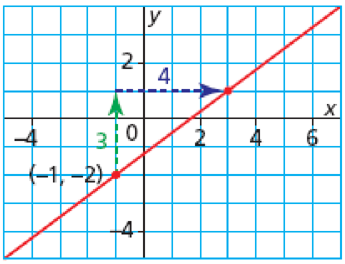
b) Write the equation in part a in slope-intercept form. What is the y-intercept of this line?

SOLUTION

a) Identify the coordinates of one point on the line and calculate the slope.
The coordinates of one point are $(-1, -2)$.
To calculate the slope, m, use:

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

$$m = \frac{3}{4}$$



(Solution continues.)

Example 2 Writing an Equation Using a Point on the Line and Its Slope

Use the slope-point form of the equation.

$$y - y_1 = m(x - x_1) \quad \text{Substitute: } y_1 = -2,\ x_1 = -1, \text{ and } m = \frac{3}{4}$$

$$y - (-2) = \frac{3}{4}[x - (-1)]$$

$$y + 2 = \frac{3}{4}(x + 1)$$

In slope-point form, the equation of the line is: $y + 2 = \frac{3}{4}(x + 1)$

b) $y + 2 = \frac{3}{4}(x + 1)$ Remove brackets.

$$y + 2 = \frac{3}{4}x + \frac{3}{4} \quad \text{Solve for } y.$$

$$y = \frac{3}{4}x + \frac{3}{4} - 2 \quad \text{Simplify.}$$

$$y = \frac{3}{4}x - \frac{5}{4}$$

In slope-intercept form, the equation of the line is: $y = \frac{3}{4}x - \frac{5}{4}$

From the equation, the y-intercept is $-\frac{5}{4}$.

CHECK YOUR UNDERSTANDING

6.5 Slope-Point Form of the Equation for a Linear Function

Example 2 Solution p.2

Example 3 Writing an Equation of a Linear Function Given Two Points

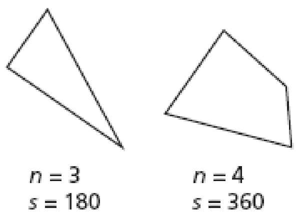
The sum of the angles, s degrees, in a polygon is a linear function of the number of sides, n, of the polygon. The sum of the angles in a triangle is 180°. The sum of the angles in a quadrilateral is 360°.

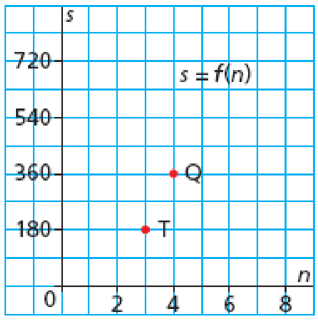
a) Write a linear equation to represent this function.

b) Use the equation to determine the sum of the angles in a dodecagon.

SOLUTION

a) $s = f(n)$, so two points on the graph have coordinates T(3, 180) and Q(4, 360)





(Solution continues.)

Example 3 Writing an Equation of a Linear Function Given Two Points

Use this form for the equation of a linear function:

$$\frac{s - s_1}{n - n_1} = \frac{s_2 - s_1}{n_2 - n_1}$$ Substitute: $s_1 = 180$, $n_1 = 3$, $s_2 = 360$, and $n_2 = 4$

$$\frac{s - 180}{n - 3} = \frac{360 - 180}{4 - 3}$$ Simplify.

$$\frac{s - 180}{n - 3} = 180$$ Multiply each side by $(n - 3)$.

$$(n - 3)\left(\frac{s - 180}{n - 3}\right) = 180(n - 3)$$

$$s - 180 = 180(n - 3)$$ This is the slope-point form of the equation. Simplify.

$$s - 180 = 180n - 540$$

$$s = 180n - 360$$ This is the slope-intercept form of the equation.

(Solution continues.)

6.5 Slope-Point Form of the Equation for a Linear Function

Example 3 Writing an Equation of a Linear Function Given Two Points

b) A dodecagon has 12 sides.
Use:
$s = 180n - 360$ Substitute: $n = 12$
$s = 180(12) - 360$
$s = 1800$
The sum of the angles in a dodecagon is 1800°.

CHECK YOUR UNDERSTANDING

Example 3 Solution p.3

Example 4 Writing an Equation of a Line That Is Parallel or Perpendicular to a Given Line

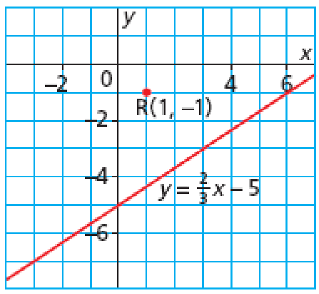
Write an equation for the line that passes through R(1, −1) and is:

a) parallel to the line $y = \frac{2}{3}x - 5$

b) perpendicular to the line $y = \frac{2}{3}x - 5$

SOLUTION

Sketch the line with equation:
$y = \frac{2}{3}x - 5$, and mark a point at R(1, −1).



Compare the equation:
$y = \frac{2}{3}x - 5$ with the equation:
$y = mx + b$
The slope of the line is $\frac{2}{3}$.

(Solution continues.)

6.5 Slope-Point Form of the Equation for a Linear Function

Example 4 **Writing an Equation of a Line That Is Parallel or Perpendicular to a Given Line**

a) Any line parallel to $y = \frac{2}{3}x - 5$ has slope $\frac{2}{3}$.

The required line passes through R(1, −1).

Use:

$$y - y_1 = m(x - x_1) \quad \text{Substitute: } y_1 = -1,\ x_1 = 1, \text{ and } m = \frac{2}{3}$$

$$y - (-1) = \frac{2}{3}(x - 1) \quad \text{Simplify.}$$

$$y + 1 = \frac{2}{3}(x - 1)$$

The line that is parallel to the line $y = \frac{2}{3}x - 5$ and passes through R(1, −1) has equation: $y + 1 = \frac{2}{3}(x - 1)$

(Solution continues.)

6.5 Slope-Point Form of the Equation for a Linear Function

Example 4 Solution p.2

Example 4 Writing an Equation of a Line That Is Parallel or Perpendicular to a Given Line

b) Any line perpendicular to $y = \frac{2}{3}x - 5$ has a slope that is the negative reciprocal of $\frac{2}{3}$; that is, its slope is $-\frac{3}{2}$.

The required line passes through R(1, −1).

Use:

$$y - y_1 = m(x - x_1) \quad \text{Substitute: } y_1 = -1,\ x_1 = 1, \text{ and } m = -\frac{3}{2}$$

$$y - (-1) = -\frac{3}{2}(x - 1) \quad \text{Simplify.}$$

$$y + 1 = -\frac{3}{2}(x - 1)$$

The line that is perpendicular to the line $y = \frac{2}{3}x - 5$ and passes through the point R(1, −1) has equation: $y + 1 = -\frac{3}{2}(x - 1)$

CHECK YOUR UNDERSTANDING

6.5 Slope-Point Form of the Equation for a Linear Function

Example 4 Solution p.3

CHECK YOUR UNDERSTANDING

1. a) Describe the graph of the linear function with this equation:

$$y + 1 = -\frac{1}{2}(x - 2)$$

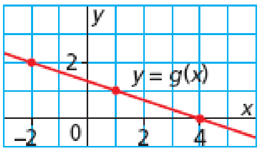
b) Graph the equation.

6.5 Slope-Point Form of the Equation for a Linear Function

CHECK YOUR UNDERSTANDING

2. a) Write an equation in slope-point form for this line.

b) Write the equation in part a in slope-intercept form. What is the y-intercept of this line?



The coordinates of another point on the line are (3, 1).
Show that these coordinates produce the same equation in slope-intercept form.

Explain how the general expression for the slope of a line can help you remember the equation $y - y_1 = m(x - x_1)$.

CHECK YOUR UNDERSTANDING

3. A temperature in degrees Celsius, c, is a linear function of the temperature in degrees Fahrenheit, f. The boiling point of water is 100°C and 212°F. The freezing point of water is 0°C and 32°F.

   a) Write a linear equation to represent this function.

   b) Use the equation to determine the temperature in degrees Celsius at which iron melts, 2795°F.

6.5 Slope-Point Form of the Equation for a Linear Function

Why is it possible for equations of a linear function to look different but still represent the same function?

6.5 Slope-Point Form of the Equation for a Linear Function

In part b, why does it make sense to use the slope-intercept form instead of the slope-point form?

6.5 Slope-Point Form of the Equation for a Linear Function

Margin Question 4

CHECK YOUR UNDERSTANDING

4. Write an equation for the line that passes through S(2, −3) and is:
   a) parallel to the line $y = 3x + 5$
   b) perpendicular to the line $y = 3x + 5$

CYU Question 4

What other strategies could you use to write an equation for each line?

6.5 Slope-Point Form of the Equation for a Linear Function

Write each equation in slope-intercept form.

6.5 Slope-Point Form of the Equation for a Linear Function

Margin Question 6

Discuss the Ideas

1. How does the fact that the slope of a line is constant lead to the slope-point form of the equation of a line?

6.5 Slope-Point Form of the Equation for a Linear Function

Discuss the Ideas

2. How can you use the slope-point form of the equation of a line to sketch a graph of the line?

6.5 Slope-Point Form of the Equation for a Linear Function

Discuss the Ideas

3. How can you determine the slope-point form of the equation of a line given a graph of the line?

6.5 Slope-Point Form of the Equation for a Linear Function