

3-6

Lines in the
Coordinate Plane

OBJECTIVES

- To graph lines and write their equations in various forms
- To classify lines as parallel, intersecting, or coinciding
- To write the equations of lines parallel or perpendicular to given lines

KEY CONCEPTS

Forms of the Equation of a Line

FORM	EXAMPLE
The point-slope form of a line is $y - y_1 = m(x - x_1)$, where m is the slope and (x_1, y_1) is a given point on the line.	$y - 3 = 2(x - 4)$ $m = 2, (x_1, y_1) = (3, 4)$ <i>4, 3</i>
The slope-intercept form of a line is $y = mx + b$, where m is the slope and b is the y-intercept.	$y = 3x + 6$ $m = 3, b = 6$ <i>(0, 6)</i>
The equation of a vertical line is $x = a$, where a is the x-intercept.	$x = 5$
The equation of a horizontal line is $y = b$, where b is the y-intercept.	$y = 2$

The standard form of a line is:

$$ax + by = c$$

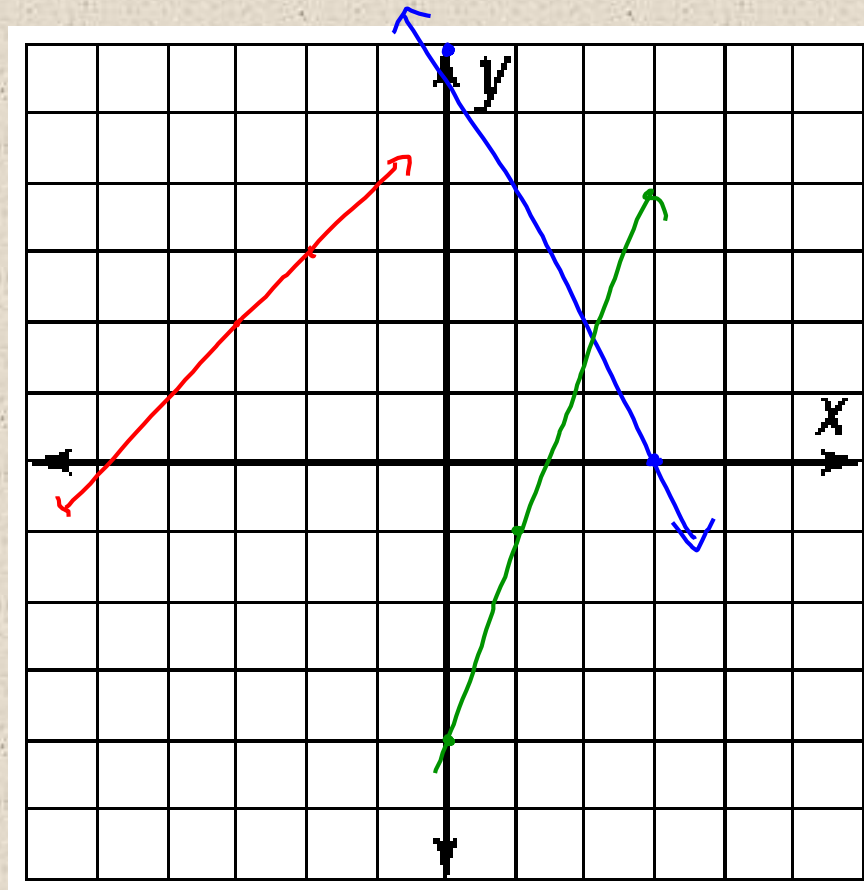
CLASS WORK

Graph each
line.

1. $4x + 2y = 12$ $(0, 6)$
 $(3, 0)$

2. $y = 3x - 4$ $(0, -4)$
 $m = \frac{3}{1}$

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



CLASS WORK

Use the given information to write an equation for each line in slope-intercept form.

3. slope 6, y-intercept 4

$$y = mx + b$$
$$y = 6x + 4$$

4. through $(-2, 0)$ and $(3, 10)$

$$m = \frac{10 - 0}{3 - (-2)} = \frac{10}{5} = 2$$
$$y - y_1 = m(x - x_1)$$
$$y - 10 = 2(x - 3)$$
$$y - 10 = 2x - 6$$
$$y = 2x + 4$$
$$y - 0 = 2(x + 2)$$
$$y = 2(x + 2)$$
$$y = 2x + 4$$

CLASS WORK

Write the equation in slope -intercept form.

6. $y - 3 = 4(x + 2)$

$$y - 3 = 4x + 8$$

$$y = 4x + 11$$

7. $2x - 3y = 12$

$$\frac{-3y}{-3} = \frac{-2x + 12}{-3}$$

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

KEY CONCEPTS

Pairs of Lines

PARALLEL LINES	INTERSECTING LINES	COINCIDING LINES
$y = 5x + 8$	$y = 2x - 5$	$y = 2x - 4$
$y = 5x - 4$	$y = 4x + 3$	$y = 2x - 4$
Same slope different y-intercept	Different slopes	Same slope , same y-intercept

Perpendicular Lines:

$$y = 3x + 5$$

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

Opposite reciprocal
slopes

CLASS WORK

Rewrite each equation in slope intercept form. Then determine whether the lines are parallel, intersecting, or coinciding. If intersecting, can you classify further as perpendicular?

8. $2y = x + 15$

$x = 2y + 5$

$\frac{2}{2}y = \frac{1}{2}x + \frac{15}{2}$
 $y = \frac{1}{2}x + \frac{15}{2}$

|| lines

$2y + 5 = x$

$\frac{2y}{2} = \frac{x}{2} - \frac{5}{2}$

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

9. $y - 6\frac{3}{4} = -\frac{1}{4}x$

$2y = 8x + 18$

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

⊥ lines

$\frac{2y}{2} = \frac{8x}{2} + \frac{18}{2}$

$y = 4x + 9$

LEARNING RUBRIC

- ▣ Got It: Write the equations of lines that are parallel or perpendicular to a given line
- ▣ Almost There: Writes the equations of a lines in slope-intercept form to classify as parallel, perpendicular, or neither
- ▣ Moving Forward: Writes the equations of lines given a point and slope, or two points
- ▣ Getting Started: Graphs lines in the coordinate plane

HOMWORK

Pages 194-195: 12 – 36 even