Objectives: Students will be able to create and graph linear functions in all three forms:
y- intercept, point slope and standard form. Students will be able to create functions parallel or perpendicular to some given lines.
Standards:
A2.F.BF.A.1 Write a function that describes a relationship between two quantities.
A2.F.BF.A.1a Determine an explicit expression, a recursive process, or steps for calculation from a context.
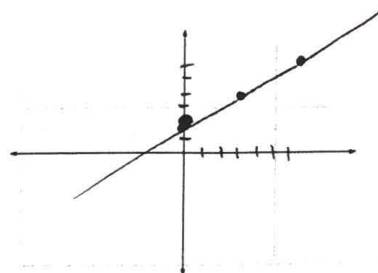A2.F.BF.A.1b Combine standard function types using arithmetic operations.

2-4 More Linear Functions

Warm up *change sign*

Graph a function $-2x + 3y = 6$**. Write it in y-intercept form then graph.**

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

Vocabulary

parallel lines - the slopes of these lines are **equal.**

perpendicular lines - the slopes of these lines are **negative reciprocals** of each other.

Examples of negative reciprocals : $1/3 \rightarrow -\frac{3}{1} = -3$ $\quad -2/3 \rightarrow \frac{3}{2}$ $\quad \frac{-1}{1} \rightarrow \frac{1}{1} = 1$ $\quad 5 \rightarrow -\frac{1}{5}$

Formulas

- point-slope form of a line is $y - y_1 = m(x - x_1)$
- standard form of a linear equation is $Ax + By = C$
- $m = -\frac{A}{B}$, y-intercept $= \frac{C}{B}$, x-intercept $= \frac{C}{A}$

Examples

1. Write the equation of the line that passes through (-6, 2) with a slope of $\frac{2}{3}$.

   a) y-intercept form $\quad m = \frac{2}{3} \quad x = -6$
   $$y = mx + b \qquad \qquad y = 2 \quad b = ?$$
   $$2 = \frac{2}{3}(-6) + b$$
   $$2 = -4 + b$$
   $$+4 \qquad +4$$
   $$b = 6 \qquad \boxed{y = \frac{2}{3}x + 6}$$

   b) point slope form
   $$y - y_1 = m(x - x_1)$$
   $$y - 2 = \frac{2}{3}(x - (-6))$$
   $$y - 2 = \frac{2}{3}(x + 6)$$

   c) standard form $\quad$ start with y int form
   $$y = \frac{2}{3}x + 6 \quad \text{multiply}$$
   $$3y = 2x + 18 \quad \text{by } 3$$
   $$-2x + 3y = 18$$

2. Write the equation of the line through (-3, 2) and (5, 8).
   $$\text{slope} \quad \frac{8-2}{5-(-3)} = \frac{6}{8} = \frac{3}{4}$$

   a) y-intercept form
   another method using point slope
   $$y - 2 = \frac{3}{4}(x + 3)$$
   $$y - 2 = \frac{3}{4}x + \frac{9}{4} \quad +2$$
   $$+2$$
   $$y = \frac{3}{4}x + \frac{17}{4}$$

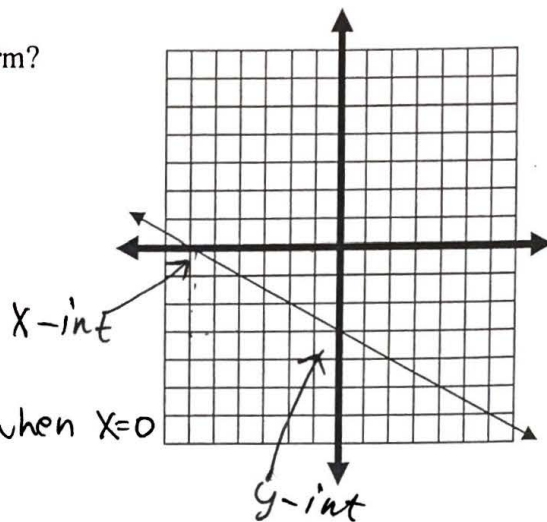   b) point slope form
   $$y - 2 = \frac{3}{4}(x + 3)$$
   OR
   $$y - 8 = \frac{3}{4}(x - 5)$$

   c) standard form
   $$y = \frac{3}{4}x + \frac{17}{4} \quad \text{multiply}$$
   $$4y = 3x + 17 \quad \text{by } 4$$
   $$-3x + 4y = 17 \quad \text{"move"} 3x$$

3. Write the equation $y = \frac{3}{4}x - 5$ in standard form. Use **integer** coefficients.

   $$y = \frac{3}{4}x - 5 \qquad \text{multiply by 4}$$
   $$4y = 3x - 20$$
   $$-3x + 4y = -20$$

4. What is the equation of the line in point-slope form?

$X-int$

5. Find the x- and y-intercepts of $2x + 3y = -12$.

$X-int$ is when $y=0$ | $y-int$ is when $X=0$

$2x = -12$ | $3y = -12$

$\boxed{X = -6}$ | $\boxed{y = -4}$

$y-int$

6. What is the equation of the line **parallel** to $y = 2x - 3$ through (1, -3) in slope-intercept form?

parallel
slope
is
Equal

$m = 2$, $X = 1$, $y = -3$, $b = ?$

$-3 = 2 \cdot 1 + b$

$\boxed{-5 = b}$

$y = 2X - 5$

7. What is the equation of the line **perpendicular** to $y = \frac{2}{3}x - 1$ through (-2, 4) in slope-intercept form?

perpendicular
slope
is NEGative
reciprocal

$m = -\frac{3}{2}$, $X = -2$, $y = 4$, $b = ?$

$4 = \frac{2}{3}(-2) + b$

$4 = -\frac{4}{3} + b$

$\frac{12}{3} = -\frac{4}{3} + b$

$\frac{16}{3} = b$

$y = -\frac{3}{2}X + \frac{16}{3}$

HOMEWORK!!! Complete your assignment on a separate sheet of paper. Show all Work

1. Write an equation for each line in slope-intercept form
   a. slope = -3, through (1, -4)   b. slope = $\frac{1}{2}$, through (2, 3)

2. What are the intercepts of $3x + y = 6$? Graph the equation.

3. If the intercepts of a line are (a, 0) and (0, b), what is the slope of the line?

4. Write the equation of the line through (1, 9) and (6, 2) in point-slope form?

5. Write an equation of each line in standard form with integer coefficients.
   a. $y = -7x - 9$ b. $y = -\frac{3}{5}x + 3$

6. Write an equation for the line shown in standard form.