Notes #2

Using Point-Slope Form and Standard Form of a Line

Objective: To write an equation of a line given its slope and a point on the line

Point-Slope Form of a Line

Use whenever you are given the slope of the line and a point, or 2 points.

The line through point (x_1,y_1) with slope m has the equation below:

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

Example 1) Write an equation given a point and the slope:

slope = $-\frac{1}{2}$, point (8, -1)

m $\quad x_1\ y_1$

$y - -1 = -\frac{1}{2}(x-8)$

$\boxed{y+1 = -\frac{1}{2}(x-8)}$

Point Slope Form

$y+1 = -\frac{1}{2}(x-8)$

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

$\quad -1 \qquad -1$

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

$y = mx + b$

Example 2) Write an equation in point-slope form through the given points:

(1, 5) and (4, -1)

$x_1 y_1 \quad x_2 y_2$

$m = -2$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1-5}{4-1} = \frac{-6}{3} = -2$

$\boxed{y-5 = -2(x-1)}$ or $y - -1 = -2(x-4)$

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

Another form of an equation is **standard form.** When possible, you write the coefficients of x and y and the constant term as integers.

Standard Form of a Linear Equation

Ax + By = C

A standard form of a linear equation is Ax + By = C, where A,B,and C are real numbers and A and B are not both zero.

Example 3) What is an equation of the line $y = \frac{3}{4}x - 5$ in standard form? Use integer coefficients.

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

$$-\frac{3}{4}x \quad -\frac{3}{4}x$$

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

$$\frac{4}{1}\left(-\frac{3}{4}x + y\right) = -5(4)$$

$$\frac{-12}{4}x + 4y = -20$$

$$\boxed{-3x + 4y = -20}$$

Example 4) Now Graph the same equation by finding the x and y intercepts.

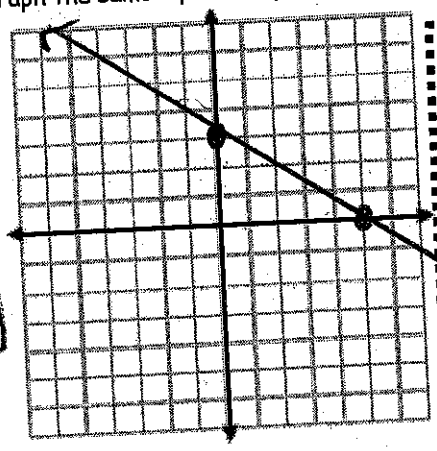
A) $3x + 5y = 15$

$\frac{3x}{3} = \frac{15}{3}$

$\boxed{x = 5 \text{ x int}}$

$\frac{5y}{5} = \frac{15}{5}$

$\boxed{y = 3 \text{ y int}}$



Steps for Graphing by finding x & y intercepts

1) Find the x-intercept; plug in 0 for y and solve for x. (x,0)

2) Find the y -intercept; plug in 0 for x, and solve for y. (0, y)

3) Now graph the intercepts and draw the line.

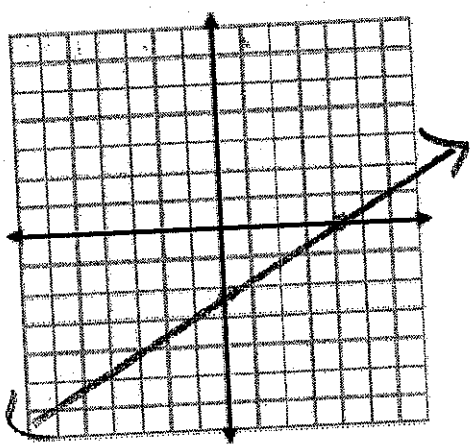
B) $2x - 4y = 8$

$\frac{2x}{2} = \frac{8}{2}$

$\boxed{x = 4}$

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

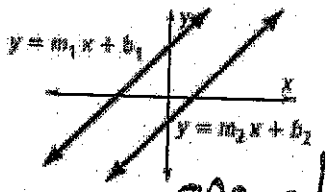
$\boxed{y = -2}$



Take note

Key Concepts Parallel and Perpendicular Lines

The slopes of parallel lines are equal.



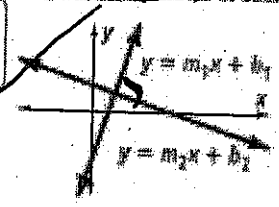
$m_1 = m_2$

$b_1 \neq b_2$

opposite reciprocals

No line can be vertical.

The slopes of perpendicular lines are negative reciprocals of each other.



$m_1 \cdot m_2 = -1$

$m_1 = \frac{1}{m_2}$

$m_2 = \frac{1}{m_1}$

m_1 and m_2 are negative reciprocals of each other.

Example 5) What is the equation of each line in slope intercept form?

a) The line parallel to y = 6x - 2 through (1,-3)

$\parallel m = 6$ $\quad x_1 y_1$

$y - -3 = 6(x-1)$

$y + 3 = 6(x-1)$

$y + 3 = 6x - 6$

$-3 \qquad -3$

$\boxed{y = 6x - 9}$

b) The line perpendicular to $y = \frac{-4x}{1} + \frac{2}{3}$ through (8,5)

$x_1 y_1$

$\perp m = \frac{1}{4}$

$y - 5 = \frac{1}{4}(x - \frac{8}{1})$

$y - 5 = \frac{1}{4}x - \frac{8}{4}$

$y - 5 = \frac{1}{4}x - 2$

$+5 \qquad +5$

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