Writing the Equation of a Straight Line

Slope-Intercept Form: $y = mx + b$

m is the slope.

b is the y-coordinate of the y-intercept ($x = 0$).

Point-Slope Form: $y - y_1 = m(x - x_1)$

m is the slope.

x_1 and y_1 are the coordinates of any point on the line.

Example 1: Use the slope-intercept form to write the equation of the straight line

(a) with slope -3 and y-intercept (0,13).

Using $y = mx + b$:

$$y = -3x + 13$$

(b) containing the points (-2,3) and (0,-1).

First use the two points to compute the slope:

$$m = \frac{y_1 - y_2}{x_1 - x_2} = \frac{(3) - (-1)}{(-2) - (0)} = \frac{4}{-2} = -2$$

Then use $y = mx + b$. (0,-1) is the y-intercept:

$$y = -2x - 1$$

Example 2: Use the point-slope form to write the equation of the line

(a) having slope -3 and containing the point (-3,4).

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

$y - (4) = -3[x - (-3)]$

$y - 4 = -3[x + 3]$

$y - 4 = -3x - 9$

$y = -3x - 5$

(b) containing the points (-2,3) and (0,-1).

First compute the slope:

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

$$m = \frac{3-(-1)}{(-2)-(0)} = \frac{4}{-2} = -2$$

Substitute either point, (-2,3) or (0,-1), for (x_1,y_1) in the point-slope form [we use (-2,3)]:

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

$y - 3 = -2[x - (-2)]$

$y - 3 = -2[x + 2]$

$y - 3 = -2x - 4$

$y = -2x - 1$

(c) containing the point (4,-7) and parallel to the graph of $5x + 6y = 7$.

Rewrite the equation of the parallel line in slope-intercept form:

$5x + 6y = 7$

$6y = -5x + 7$

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

The slope is -5/6 and parallel lines must have the same slope. Substitute m = -5/6 and (4, -7) into the point-slope form:

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

$$y-(-7) = \frac{-5}{6}(x-4)$$

$$y+7 = \frac{-5}{6}x+\frac{10}{3}$$

$$y = \frac{-5}{6}x+\frac{10}{3}-7$$

$$y = \frac{-5}{6}x+\frac{10}{3}-\frac{21}{3}$$

$$y = \frac{-5}{6}x-\frac{11}{3}$$