Algebra I
Notes 5.5 The Point-Slope Form of an Equation

Objectives: Given a point and a slope, write an equation in the form $y - y_1 = m(x - x_1)$.
Given two points, write an equation in the form $y - y_1 = m(x - x_1)$.

Using the linear form of an equation $y - y_1 = m(x - x_1)$ (called point-slope form),

m represents the slope of the line; and

(x_1, y_1) represents a point on the line.

Examples:

1. Write an equation in *point-slope* form for a line with slope 2 containing the point (3, 4).

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

$y - 4 = 2(x - 3)$

$y - 4 = 2x - 6$

$+4 \quad +4$

$y = 2x - 2$

Write an equation in *point-slope* form for a line with slope -3 containing the point (1, -6).

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

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

$y + 6 = -3x + 3$

$-6 \quad -6$

$y = -3x - 3$

3. Write an equation in *point-slope* form for a line with slope ½ containing the point (-7, -8).

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

$y - -8 = \frac{1}{2}(x + 7)$

$y + 8 = \frac{1}{2}x + \frac{7}{2}$

$-8 \quad -8$

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

Practice: Write an equation in *point-slope* form for each line with the given slope and point.

4. slope 6; point (9, 5).

$y - 5 = 6(x - 9)$

$y - 5 = 6x - 54$

$+5 \quad +5$

$y = 6x - 49$

5. slope -4; point (-4, 8)

$y - 8 = -4(x + 4)$

$y - 8 = -4x - 16$

$+8 \quad +8$

$y = -4x - 8$

6. slope ¼; point (-10, -5)

$y - -5 = \frac{1}{4}(x + 10)$

$y + 5 = \frac{1}{4}x + 2.5$

$-5 \quad -5$

$y = \frac{1}{4}x - 2.5$

If you are given <u>two points</u>, find the *slope* first then use one of the *points* in the equation.

1. Write an equation in *point-slope* form for a line containing the points (6, 4) and (1, 5).

$m = \frac{5-4}{1-6} = \frac{1}{-5} = -\frac{1}{5}$

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

$y - \underline{4} = \underline{\frac{-1}{5}}(x - \underline{6})$ or $y - \underline{5} = \underline{\frac{-1}{5}}(x - \underline{1})$

2. Write an equation in *point-slope* form for a line containing the points (7,0) and (-1,8).

$m = \frac{8-0}{-1-7} = \frac{8}{-8} = -1$

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

$y - \underline{0} = \underline{-1}(x - \underline{7})$ $\quad y = -1x + 7$

$y = -1x + 7$

3. Write an equation in *point-slope* form for a line containing the points (-9,6) and (-8,-5).

$m = \frac{-5-6}{-8+9} = \frac{-11}{1} = -11$

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

$y - \underline{6} = \underline{-11}(x + \underline{9})$ $\quad y = -11x - 93$

$y - 6 = -11x - 99$

$+6 \qquad +6$

<u>Practice</u>: Write an equation in *point-slope* form for each line with the given points.

4. (8, 3) and (9, 5).

$m = \frac{5-3}{9-8} = \frac{2}{1} = 2$

$y - \underline{3} = \underline{2}(x - \underline{8})$

5. (-4, -6) and (4, -8)

$m = \frac{-8+6}{4+4} = \frac{-2}{8} = -\frac{1}{4}$

$y + \underline{6} = \underline{-\frac{1}{4}}(x + \underline{4})$

6. (-10, -5) and (5, 8)

$m = \frac{8+5}{5+10} = \frac{13}{15}$

$y + \underline{5} = \underline{\frac{13}{15}}(x + \underline{10})$

7. (2, 1) and (-7, -5).

$m = \frac{-5-1}{-7-2} = \frac{-6}{-9} = \frac{2}{3}$

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

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

8. (-1, -3) and (5, -1)

$m = \frac{-1+3}{5+1} = \frac{2}{6} = \frac{1}{3}$

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

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

9. (-12, 6) and (7, 18)

$m = \frac{18-6}{7--12} = \frac{12}{19}$

$y - \underline{6} = \underline{\frac{12}{19}}(x + \underline{12})$