Lesson 4: Two Forms of a Linear Equation

Objective: Write the equation of a line in slope-intercept and point-slope form.

Students will be able to:

- Find the slope of a line having certain characteristics.
- Identify a $y-$intercept.
- Convert between point-slope and slope-intercept forms.

Prerequisite Knowledge:

- Definitions of slope of a line and $y-$intercept.
- Graphing points on a coordinate plane .
- Point-testing.
- Multiplying and dividing fractions.

Lesson:
The two forms for a linear equation are:

$$\begin{aligned} \text{slope-intercept form:} \quad & y = mx + b \\ \text{point-slope form:} \quad & y - y_1 = m(x - x_1) \end{aligned}$$

I - Motivating Example(s):

Find the equation of the line through the points $(-3, 4)$ and $(-1, -2)$. Express your answer in slope-intercept form.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$ Use the given points to find the slope.

$$m = \frac{-2-4}{-1-(-3)} = \frac{-6}{2} = -3$$ Substitute the $x-$ and $y-$ coordinates and simplify.

$$y - y_1 = m(x - x_1)$$ Use the point-slope form. Substitute m and either point.

$$y - 4 = -3(x - (-3))$$ Simplify to obtain slope-intercept form. Distribute m.

$$y - 4 = -3x - 9$$ Solve for y.

$$y = -3x - 5$$ Our solution, in slope-intercept form.

II - Demo/Discussion Problems:

For each problem, find the equation of a line having the given characteristics. In each case, find both the point-slope and slope-intercept forms.

1. A line through the point $(-6, 2)$ and having a slope of $-\frac{2}{3}$.
2. A line through the points $(-2, 5)$ and $(4, -3)$.

III - Practice Problems:

Find the point-slope form of the line through the given point with the given slope.

1) through $(2, 3)$, slope is undefined
2) through $(1, 2)$, slope is undefined
3) through $(2, 2)$, slope is $\frac{1}{2}$
4) through $(2, 1)$, slope is $-\frac{1}{2}$
5) through $(-1, -5)$, slope is 9
6) through $(2, -2)$, slope is -2
7) through $(-4, 1)$, slope is $\frac{3}{4}$
8) through $(4, -3)$, slope is -2
9) through $(0, -2)$, slope is -3
10) through $(-1, 1)$, slope is 4
11) through $(0, -5)$, slope is $-\frac{1}{4}$
12) through $(0, 2)$, slope is $-\frac{5}{4}$
13) through $(-5, -3)$, slope is $\frac{1}{5}$
14) through $(-1, -4)$, slope is $-\frac{2}{3}$
15) through $(-1, 4)$, slope is $-\frac{5}{4}$
16) through $(1, -4)$, slope is $-\frac{3}{2}$

Find the slope-intercept form of the line through the given point with the given slope.

17) through $(-1, -5)$, slope is 2
18) through $(2, -2)$, slope is -2
19) through $(5, -1)$, slope is $-\frac{3}{5}$
20) through $(-2, -2)$, slope is $-\frac{2}{3}$
21) through $(-4, 1)$, slope is $\frac{1}{2}$
22) through $(4, -3)$, slope is $-\frac{7}{4}$
23) through $(4, -2)$, slope is $-\frac{3}{2}$
24) through $(-2, 0)$, slope is $-\frac{5}{2}$
25) through $(-5, -3)$, slope is $-\frac{2}{5}$
26) through $(3, 3)$, slope is $\frac{7}{3}$
27) through $(2, -2)$, slope is 1
28) through $(-4, -3)$, slope is 0
29) through$(-3, 4)$, slope is undefined
30) through $(-2, -5)$, slope is 2
31) through $(-4, 2)$, slope is $-\frac{1}{2}$
32) through $(5, 3)$, slope is $\frac{6}{5}$

Find the point-slope form of the line through the given points.

33) through $(-4, 3)$ and $(-3, 1)$
34) through $(1, 3)$ and $(-3, 3)$
35) through $(5, 1)$ and $(-3, 0)$
36) through $(-4, 5)$ and $(4, 4)$
37) through $(-4, -2)$ and $(0, 4)$
38) through $(-4, 1)$ and $(4, 4)$
39) through $(3, 5)$ and $(-5, 3)$
40) through $(-1, -4)$ and $(-5, 0)$
41) through $(3, -3)$ and $(-4, 5)$
42) through $(-1, -5)$ and $(-5, -4)$

Find the slope-intercept form of the line through the given points.

43) through $(-5, 1)$ and $(-1, -2)$
44) through $(-5, -1)$ and $(5, -2)$
45) through $(-5, 5)$ and $(2, -3)$
46) through $(1, -1)$ and $(-5, -4)$
47) through $(4, 1)$ and $(1, 4)$
48) through $(0, 1)$ and $(-3, 0)$

49) through $(0, 2)$ and $(5, -3)$

50) through $(0, 2)$ and $(2, 4)$

51) through $(0, 3)$ and $(-1, -1)$

52) through $(-2, 0)$ and $(5, 3)$