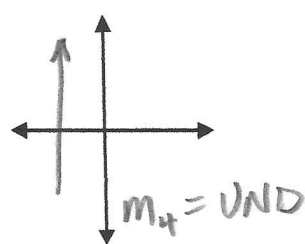
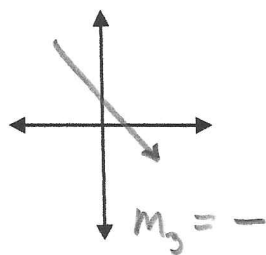
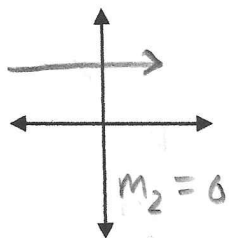
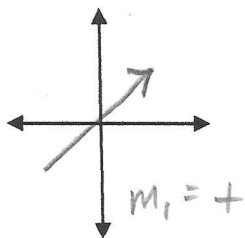


# P4 – Linear Models

Slope

$$m = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}, x_1 \neq x_2$$

$\Delta \rightarrow$  delta



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

mult both sides by  $(x_2 - x_1)$  to get

Point-Slope form of a line  $(y_2 - y_1) = m(x_2 - x_1)$

Example 1 Find an equation of the line that has a slope of 3 and passes through the

point  $(1, -2)$

$$(x_1, y_1) \quad y - (-2) = 3(x - 1)$$

$$y + 2 = 3(x - 1) \quad \text{then, by solving for } y$$

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

$$y = 3x - 5 \quad \text{i get this}$$

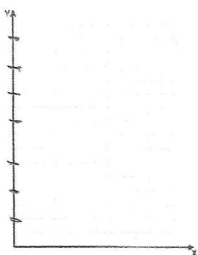
Slope-Intercept form of a line  $y = mx + b$

Example 3 Sketch the graph of each equation.

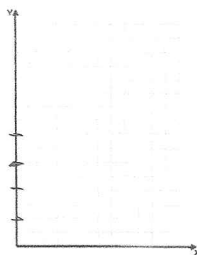
a.  $y = 2x + 1$



b.  $y = 2$



c.  $3y + x - 6 = 0$



Because vertical lines cannot be written in slope-intercept form, we have the General Form. Any linear equation can be written in this form.

General Form of a line  $Ax + By + C = 0$

### Parallel and Perpendicular Lines

Parallel  $m_1 = m_2$  same slope

Perpendicular  $m_1 = -\frac{1}{m_2}$  slopes are opposite reciprocals

Example 4 Find the General forms of the lines that pass through the point (2, -1) and are

a. Parallel to the line  $2x - 3y = 5$

① find slope, solve y

$$-3y = -2x + 5$$

$$y = \frac{2}{3}x - \frac{5}{3}$$

$$m = \frac{2}{3}$$

point = (2, -1)

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

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

$$3(y + 1) = 2(x - 2)$$

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

$$2x - 3y - 5 = 0$$

b. perpendicular to the line  $2x - 3y = 5$

$$m = -\frac{3}{2}$$

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

$$-2(y + 1) = 3(x - 2)$$

$$-2y - 2 = 3x - 6$$

$$3x + 2y - 4 = 0$$

HW: 27-32, 49-56, 59-64

In Exercises 27–32, find an equation of the line that passes through the point and has the indicated slope. Sketch the line.

<u>Point</u>	<u>Slope</u>	<u>Point</u>	<u>Slope</u>
27. $(0, 3)$	$m = \frac{3}{4}$	28. $(-1, 2)$	$m$ undefined
29. $(0, 0)$	$m = \frac{2}{3}$	30. $(0, 4)$	$m = 0$
31. $(3, -2)$	$m = 3$	32. $(-2, 4)$	$m = -\frac{3}{5}$

In Exercises 49–56, sketch a graph of the equation.

49.  $y = -3$

50.  $x = 4$

51.  $y = -2x + 1$

52.  $y = \frac{1}{3}x - 1$

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

54.  $y - 1 = 3(x + 4)$

55.  $2x - y - 3 = 0$

56.  $x + 2y + 6 = 0$

In Exercises 59–64, write an equation of the line through the point (a) parallel to the given line and (b) perpendicular to the given line.

<u>Point</u>	<u>Line</u>	<u>Point</u>	<u>Line</u>
59. $(2, 1)$	$4x - 2y = 3$	60. $(-3, 2)$	$x + y = 7$
61. $(\frac{3}{4}, \frac{7}{8})$	$5x - 3y = 0$	62. $(-6, 4)$	$3x + 4y = 7$
63. $(2, 5)$	$x = 4$	64. $(-1, 0)$	$y = -3$