

## 2.1 Linear Functions and Models;

Recall slope of a line ( $m$ )

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

TWO TYPES OF Equations of Lines

① point-slope form of the equation of a line:

An equation of the line that passes through the point  $(x_1, y_1)$  and has slope  $m$  is

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

\* Used when you have either 2 points or 1 point and the slope

ex. Find the equation of the line through  $(1, -3)$  with slope  $= -\frac{1}{2}$ . Sketch the line

equation:

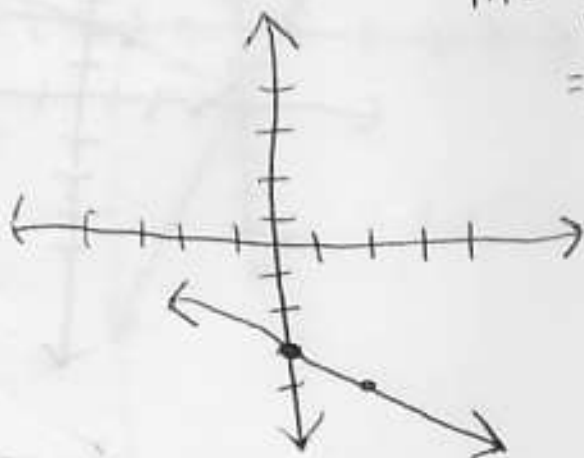
$$y - y_1 = m(x - x_1)$$

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

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

$$m = -\frac{1}{2} = \frac{\text{rise}}{\text{run}}$$

$$= \frac{\text{Down 1}}{\text{Right 2}}$$



Example:

Find the equation of the line through two points  $(-1, 2)$   $(3, 4)$

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

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

Also need  $(x_1, y_1) =$  choose either  $(3, 4)$  or  $(-1, 2)$

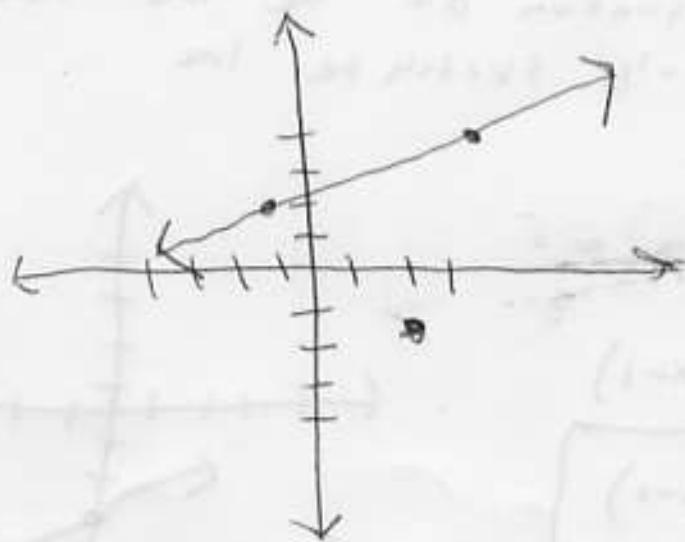
$$y - 4 = \frac{1}{2}(x - 3) \quad \text{or} \quad y - 2 = \frac{1}{2}(x - (-1))$$

$$y = \frac{1}{2}x - \frac{3}{2} + 4$$

$$y = \frac{1}{2}x + \frac{5}{2}$$

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

$$y = \frac{1}{2}x + \frac{5}{2}$$



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

$$(1-2) \frac{1}{2} = -1 = -1$$

slope-intercept form of line:

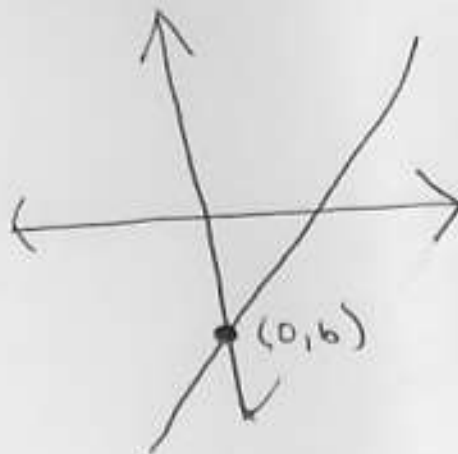
recall

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

$$y - b = m(x - 0)$$

$$y = mx + b$$

$m = \text{slope}$ ,  $b = y\text{-int}$



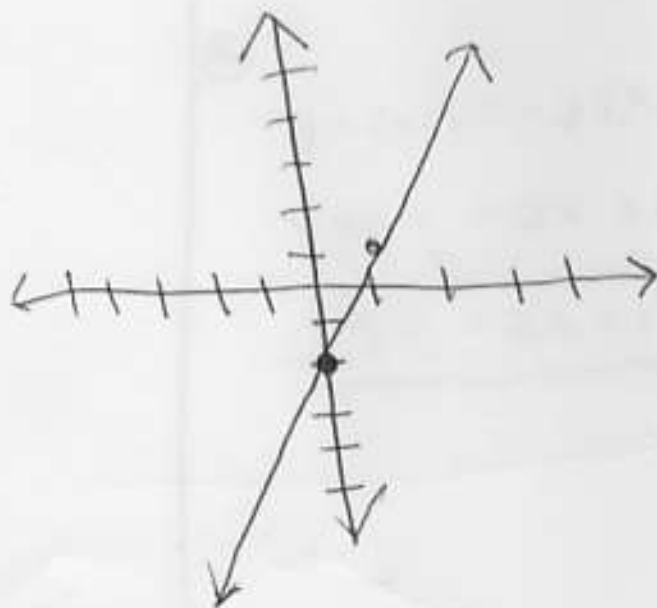
$b = y\text{-intercept}$

Find the equation of the line with slope 3 and y-intercept -2.

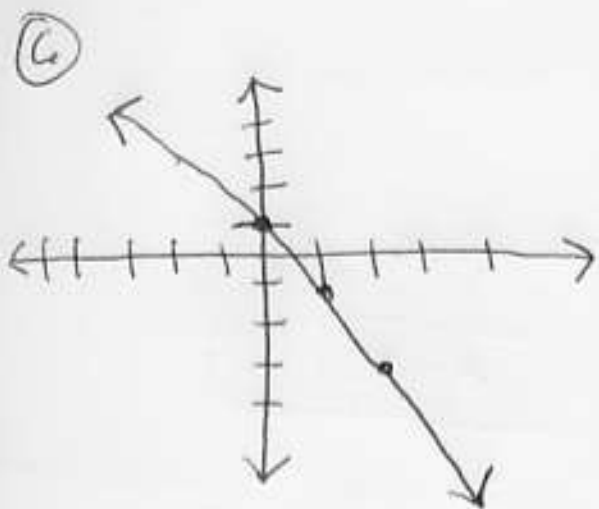
$$m = 3, \quad y\text{-intercept} = -2 = b$$

$$y = 3x - 2$$

$$m = \frac{3}{1} = \frac{\text{rise}}{\text{run}}$$



Given the Graph find the equation of the line:



① Pick two points (possibly y-int)

$$P_1 = (0, 1) \quad P_2 = (1, -1)$$

② Find slope

$$m = \frac{-1 - 1}{1 - 0} = \frac{-2}{1} = -2$$

③ y-intercept =  $b = 1$

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

$$P_1 = (2, -3) \quad P_2 = (1, -1)$$

① Find slope

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

②

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

$$y + 1 = -2x + 2$$

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