

3/3/14 Chapter 6

6.2 Graph  $2x + y = 4$

Linear equation

$$x=0, \quad 2(0) + y = 4 \\ y = 4$$

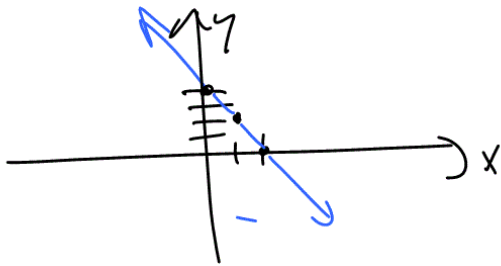
$$y=0, \quad 2x + 0 = 4$$

$$\frac{2x}{2} = \frac{4}{2} \quad x=2$$

$(0, 4), (2, 0), (1, 2)$

X	Y
0	4
2	0
1	2

$$x=1, \\ 2(1) + y = 4 \\ 2 + y = 4 \\ -2 \quad -2 \\ y = 2$$

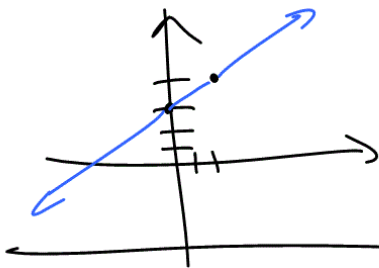


2x Graph:  $y = \frac{1}{2}x + 3$

$$y = \frac{1}{2}(0) + 3 = 3$$

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

X	Y
0	3
2	4



(ex)

$$y = mx + b$$

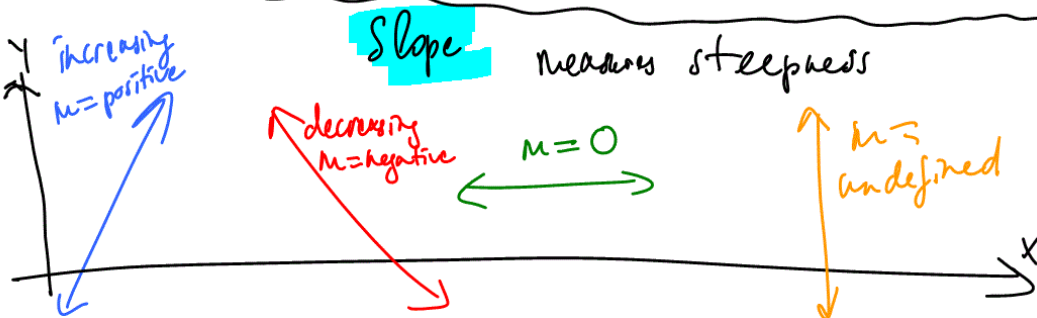
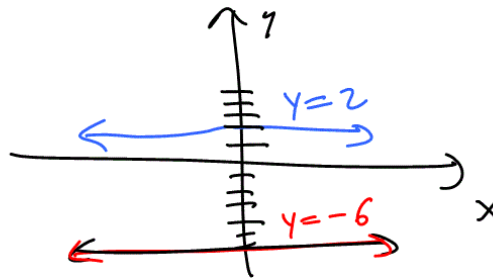
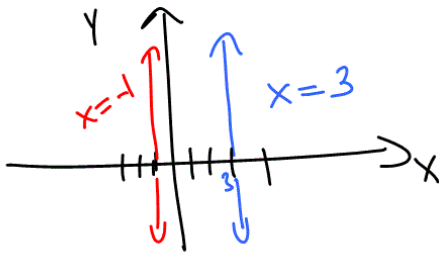
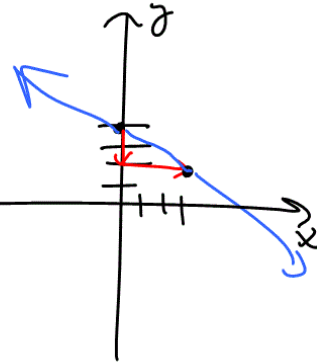
$m = \text{slope}$ ,  $b = \text{y-intercept}$

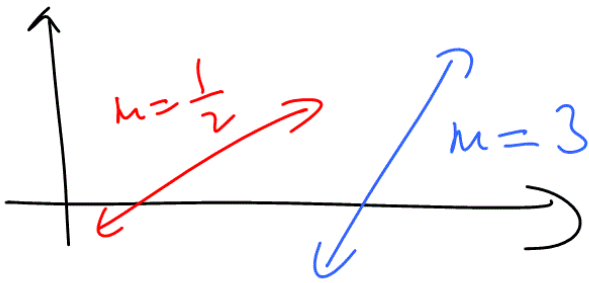
$$m = \frac{\text{rise}}{\text{run}}$$

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

$$m = \frac{-2}{3} = \frac{\text{rise}}{\text{run}}$$

$$\text{y-intercept} = 4$$





(6.1) Graph:  $\frac{2}{3}x + 2y = 6$

x	y
0	3
3	2

$$\frac{2}{3}x + 2y = 6$$

$$2 + 2y = 6$$

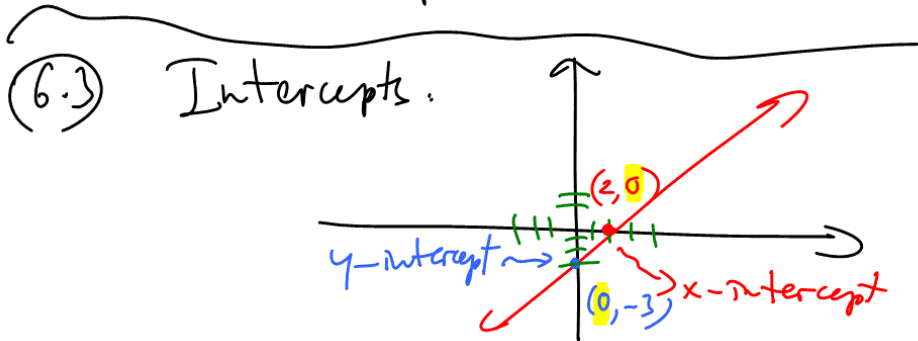
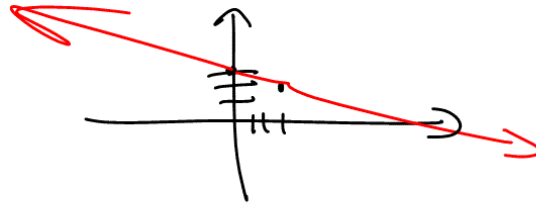
$$\begin{array}{r} 2 + 2y = 6 \\ -2 \quad -2 \\ \hline 2y = 4 \\ y = 2 \end{array}$$
  

$$\frac{2}{3}(0) + 2y = 6$$

$$2y = 6$$

$$\frac{2}{2} \quad \frac{6}{2}$$

$$y = 3$$

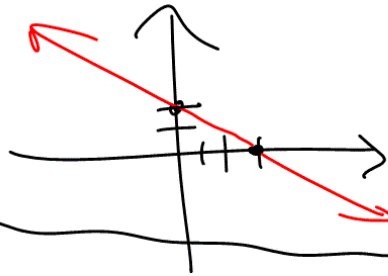


To find **x-intercept**: let  $y=0$  and find  $x$   
 To find **y-intercept**: let  $x=0$ , & find  $y$

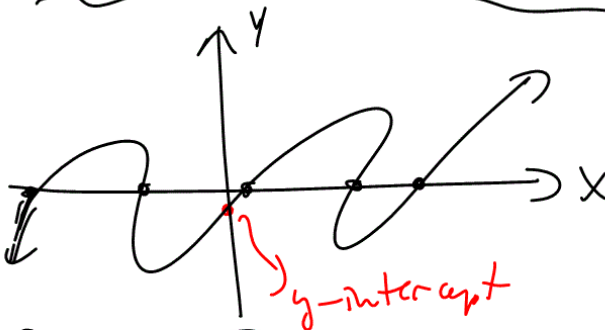
# 20 Graph by finding and plotting the  
 Intercepts:  $2x+3y=6$

x-intercept:  $y=0$ ,  $2x=6$   
 $x=3$   
 $(3, 0)$

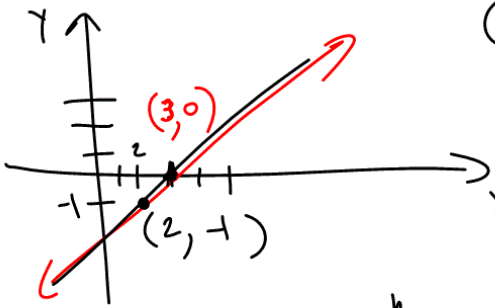
y-intercept:  $x=0$ ,  $3y=6$   
 $y=2$   
 $(0, 2)$



5 x-intercepts



## 6.4 Slope and Rate of Change



$$(x_1, y_1), (x_2, y_2)$$

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

$$(2, -1), (3, 0)$$

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

parallel lines:  
same slope

$$m = 3$$

$$m = 3$$

perpendicular lines

$$m = 4; -\frac{1}{4}$$

$$m = -\frac{2}{3}; \frac{1}{2}$$

Ex) find the slope of  $2x + y = 4$

change to  $y = mx + b$

$$y = -2x + 4$$

$$\text{Slope} = \boxed{-2}$$

(2x) Find slope:  $2x + 4y = 5$

$$\begin{array}{r} -2x \\ \hline 4y = -2x + 5 \end{array}$$

$$\frac{4y}{4} = \frac{-2x + 5}{4}$$

$$y = -\frac{2}{4}x + \frac{5}{4}$$

$$y = -\frac{1}{2}x + \frac{5}{4}$$

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

(2x) Determine if the lines are parallel, perpendicular or neither:

$\begin{array}{l} -y = -4x + 5 \\ \frac{-y}{-1} = \frac{-4x + 5}{-1} \\ y = 4x - 5 \end{array}$	$\begin{array}{l} x - 6y = -5 \\ 4x - y = 5 \\ \quad +y \quad +y \\ 4x = 5 + y \\ \quad -5 \quad -5 \\ 4x - 5 = y \\ y = 4x - 5 \\ m = 4 \end{array}$	$\begin{array}{l} \Rightarrow \frac{-6y}{-6} = \frac{-x - 5}{-6} \\ y = \frac{-x}{-6} - \frac{5}{-6} \\ y = \frac{1}{6}x + \frac{5}{6} \\ m = \frac{1}{6} \end{array}$
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(neither)

## 6.5 Equations of Lines

$$y = mx + b$$

slope-intercept form

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

point-slope form  
 $(x_1, y_1)$

(ex) slope = 3, y-intercept is  $(0, 4)$

$$y = 3x + 4$$

$$m = 3, b = 4$$

slope =  $\frac{2}{3}$ , contains the point

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

$$(4, 5)$$

$(x_1, y_1)$

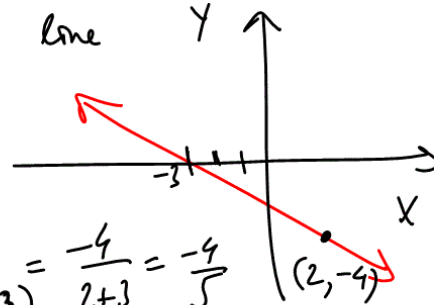
$$y - 5 = \frac{2}{3}(x - 4)$$

(ex) Write equation of the line

Need a point & slope

$$(-3, 0), (2, -4)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-4 - 0}{2 - (-3)} = \frac{-4}{2 + 3} = \frac{-4}{5}$$



$$(x_1, y_1) = (-3, 0), m = -\frac{4}{5}$$

$$y - 0 = -\frac{4}{5}(x - (-3))$$

$$y = -\frac{4}{5}(x + 3)$$

(b) Write equation in standard form:

$$Ax + By = C$$

$$S. y = S. \left( -\frac{4}{5} \right) (x+3)$$

$$5y = -4x - 12$$

+4x

+4x

$$\boxed{4x + 5y = -12}$$

$$Ax + By = C$$

(c) Write equation of the line going through the point  $(3, 5)$  and having  $x$ -intercept at  $x = -2$ .

Change it to form  $Ax + By = C$



$$(3, 5), (-2, 0)$$

$$m = \frac{0 - 5}{-2 - 3} = \frac{-5}{-5} = 1$$

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

$$y - 0 = 1(x - (-2))$$



$$Ax + By = C$$

$$\begin{array}{r} y = x + 2 \\ \underline{-x \quad -x} \\ -x + y = 2 \end{array}$$

OR  $x - y = -2$

ⓧ Write equation of the line perpendicular to the line  $2x - y = 7$  and going through the point  $(2, -1)$

$(x_1, y_1) = (2, -1)$  need slope.

$$2x - y = 7 \Rightarrow y = mx + b$$

$$\begin{array}{r} 2x = 7 + y \\ \underline{-7 \quad -7} \\ 2x - 7 = y \\ mx + b = y \\ m = 2 \end{array}$$

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

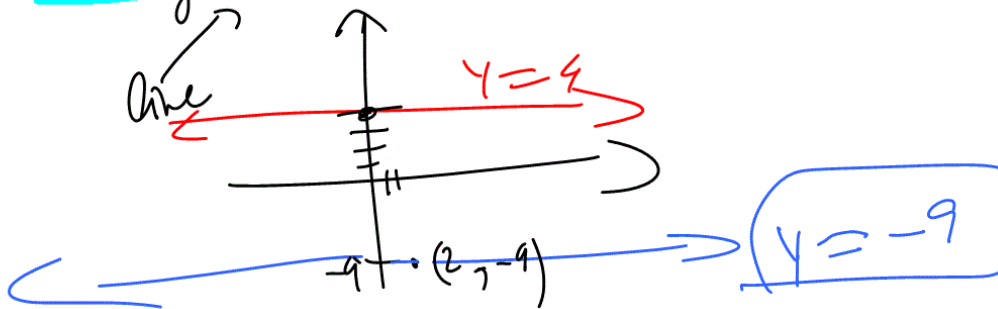
$(x_1, y_1) = (2, -1)$

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

$$\begin{aligned}
 2(y+1) &= 2\left(-\frac{1}{2}\right)(x-2) \\
 2y+2 &= -1(x-2) \\
 2y+2 &= -x+2 \\
 \hline
 2y &= -x+0 \\
 +x & \quad +x \\
 \hline
 x+2y &= 0 \\
 \boxed{Ax+By=C}
 \end{aligned}$$

$\left(\frac{1}{2}x+y=0\right) \cdot 2$

(EX) Find an equation of the line parallel to  $y=4$  and passing through  $(2, -9)$



## 6.5a Graphing Linear Inequalities in two variables

Ex Graph  $x + y < 4$

① Graph line  $x + y = 4$  : dashed line

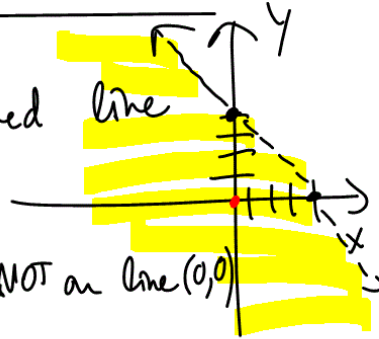
x	y
0	4
4	0

② Shade

Test a point NOT on line  $(0,0)$

$$0 + 0 < 4$$

$$0 < 4 \text{ True}$$



Ex Graph:  $2x \geq y$

① Graph  $2x = y$  : solid line

x	y
0	0
1	2

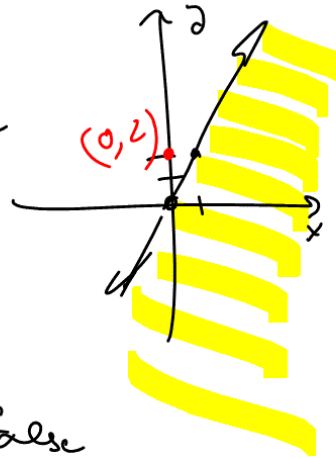
$$y = 2(0) = 0$$

$$y = 2(1) = 2$$

② Test  $(0, 2)$   $x=0, y=2$

$$2(0) \geq 2$$

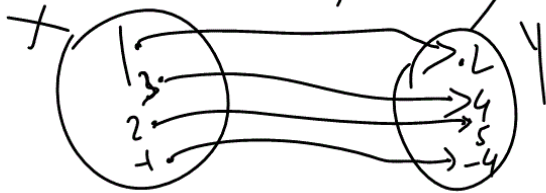
$$0 \geq 2 \text{ False}$$



## 6.6 Functions

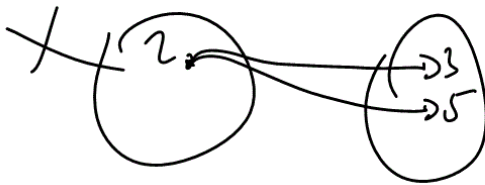
A function is a set of ordered pairs where **for each  $x$  there is exactly one  $y$ .**

$(1, 2), (3, 4), (2, 5), (-1, -4)$



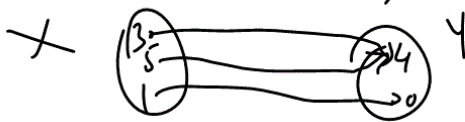
it is a function

$(2, 3), (2, 5), (6, 7)$



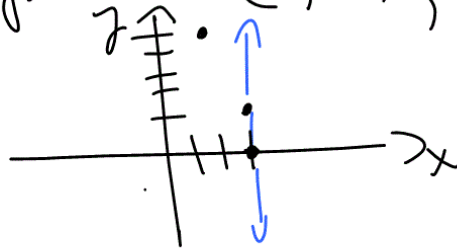
Not a function

$(3, 4), (5, 4), (1, 0)$

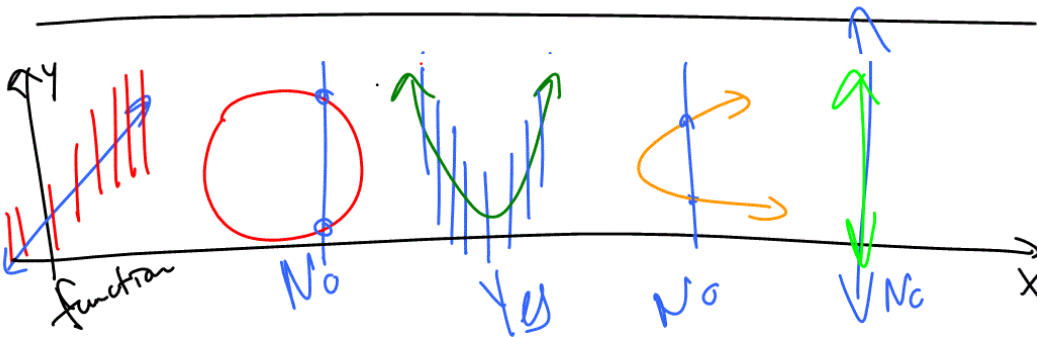


function

Not a function:  $(3, 0)$ ,  $(3, 1)$ ,  $(2, 5)$



**Vertical Line Test** | If you can draw a vertical line that intersects your graph at 2 or more points, it is NOT a function.



**Domain**  $\Rightarrow$  all  $x$  values

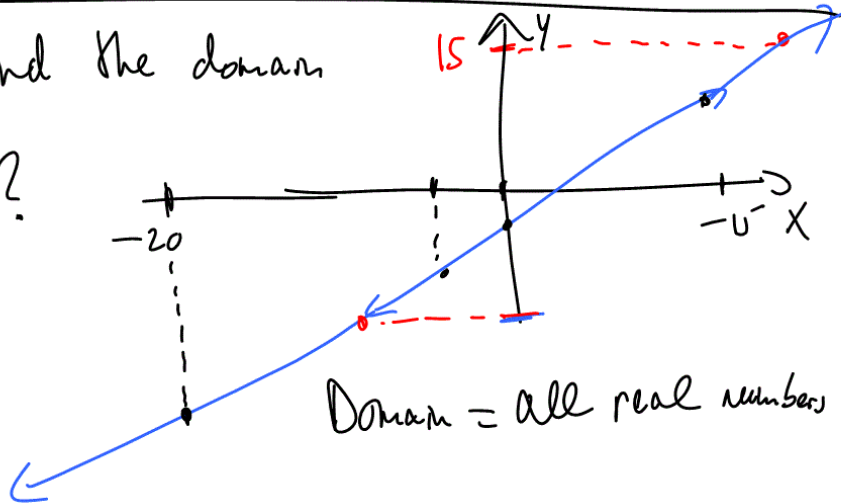
**Range**  $=$  all  $y$  values

ⓧ  $(1, 2)$ ,  $(3, 5)$ ,  $(-3, -6)$

domain  $\{1, 3, -2\}$  , range =  $\{2, 5, -6\}$

(21) find the domain

Range = ?



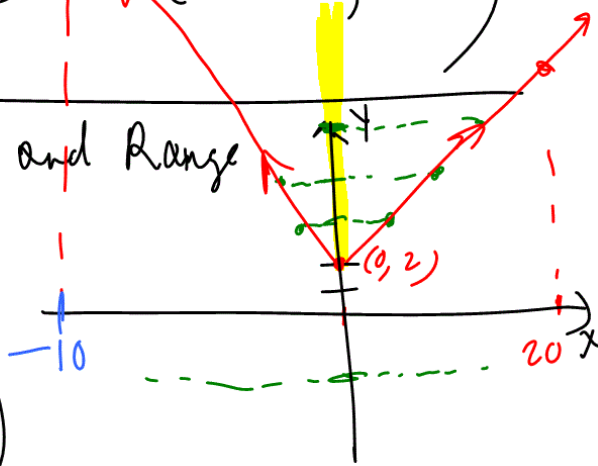
Interval :  $(-\infty, \infty)$

Range :  $(-\infty, \infty)$

(22) find domain and Range

Domain:  $(-\infty, \infty)$

Range  $[2, \infty)$

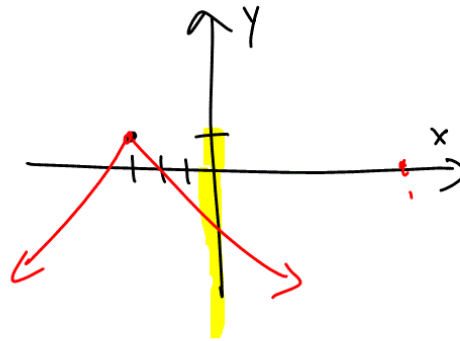


(a) find domain and range.

(smaller, larger)

Domain:  $(-\infty, \infty)$

Range:  $(-\infty, 1]$



find domain and range.

Domain:  $[-3, 3]$

Range:  $[-2, 2]$

