$$y = mx + b \qquad mx - y + b = 0$$

Lesson 4 – General Form Ax+By+C=0

x-intercept- the x coordinate of the point when a line or curve crosses the x-axis; the value of x when y=0.

y-intercept – the y coordinate of the point when a line or curve crosses the y-axis; the value of y when x=0

Example 1:
For the linear equation 2x+3y-12=0,
   a) state the x-intercept $(x, 0)$ $y = 0$

$$2x + 3(0) - 12 = 0$$
$$2x - 12 = 0 \qquad \frac{2x}{2} = \frac{12}{2} \quad x = 6$$
$$+12 \quad +12$$

Therefore, the coordinates for the x-intercept is (6,0)

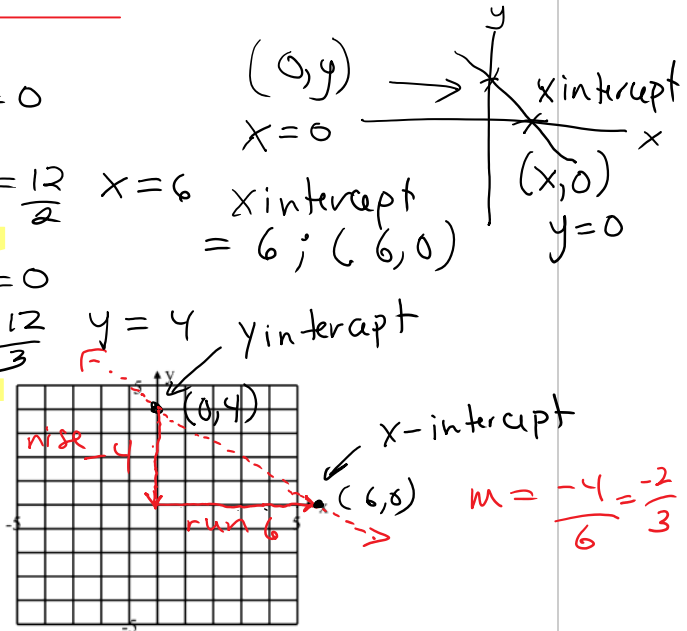$(0, y)$ → x intercpt

$x = 0$

x intercept $= 6 ; (6, 0)$ $(x, 0)$ $y = 0$

   b) state the y-intercept $(0, y)$ $x = 0$

$$2(0) + 3y - 12 = 0$$
$$3y - 12 = 0 \qquad \frac{3y}{3} = \frac{12}{3} \quad y = 4$$
$$+12 \quad +12$$

Therefore, the coordinates for the y-intercept is (0,4)

y intercept

   c) use the intercepts to graph the line.

rise $(0, 4)$

x-intercpt

$(6, 0)$ $m = \frac{-4}{6} = \frac{-2}{3}$

   d) What is the slope of this graph?

$$m = \frac{\Delta y}{\Delta x} = \frac{4 - 0}{0 - 6} = \frac{4}{-6} = \frac{-2}{3}$$

run 6

   e) Determine the equation of the line using slope-intercept form, that is, **y-mx+b**

$$y = \frac{-2}{3} + 4 \qquad \qquad y = 4$$
$$0 - b$$

Example 2:
Change the equation from standard from 2x + 3y -12 = 0 to slope-intercept from algebraically.

$$Ax + by + c = 0 \quad \rightarrow \quad y = mx + b$$

$$2x + 3y - 12 = 0$$
$$+12 \quad -2x + 12$$

$$\frac{3y}{3} = \frac{-2x + 12}{3}$$

$$y = \frac{-2}{3}x + 4_{104}$$

$$Ax + By + C = 0 - c$$
$$-Ax \qquad -C \quad -Ax$$

$$\frac{By}{B} = \frac{-Ax}{B} - \frac{C}{B}$$

$$y = \frac{-A}{B}x - \frac{C}{B}$$

$$2x + 3y - 12 = 0$$

$$A = 2 \quad B = 3 \quad C = -12$$

$$m = \frac{-(2)}{3} = \frac{-2}{3} \left(\frac{-A}{B}\right)$$

$$b = \frac{-(-12)}{3} \left(\frac{-C}{}\right)$$

$$y = mx + b$$

y intercept

$$m = \frac{-A}{B} \qquad b = \frac{-C}{B}$$

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

$$b = \frac{\frac{3}{-1}(-12)}{3}$$

$$= \frac{12}{3} = 4$$

$\left(\dfrac{C}{B}\right)$

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

Example 3:

Parents of the cheerleading squad rent a hall. They arrange a talent show as a fundraiser. The relationship between the number of tickets sold, x, and the profit, y, in dollars, may be represented by the equation 24x-2y-1680=0.

a) What is the slope of the line?
b) Identify the y-intercept.
c) How many tickets must the parents sell to reach the break-even point.

a) $24x - 2y - 1680 = 0 \rightarrow y = mx + b$

$-24x \qquad +1680 \quad -24x + 1680$

$\dfrac{-2y}{-2} = \dfrac{-24x}{-2} + \dfrac{1680}{-2}$

$y = 12x - 840$ $b = -840$ (0, -840)

a) $m = \dfrac{-A}{B}$ b) $b = -C$

$= -24$ $b = \dfrac{-1(-1680)}{-2}$

$m = 12$ $b = \dfrac{1680}{-2}$

y intercept $b = -840$

c) $y = 12x - 840$ y = profit
   $y = 0$

$0 = 12x - 840$

$+840 \qquad +840$

$\dfrac{840}{12} = \dfrac{12x}{12}$ $x = 70$

must sell 70 tickets to break even.

Example 4:

Rewrite the equation each equation in general form, Ax+By+C=0. What is the x and y intercepts of these lines?

a) y=-(2/3)x+6   y intercept = 6

$+\frac{2}{3}x - 6 \quad +\frac{2}{3}x \quad -6$

$3\left[\dfrac{2}{3}x + y - 6\right] = [0] 3$

$2x + 3y - 18 = 0$

x intercept (y=0 = 9)

$2x + 3(0) - 18 = 0$

$x = 9$

b) y = (3/4)x - 2   y intercept = -2   x intercept = 8/3

$+18 \quad -4$

$3 \quad 2x - 18 = 0 \quad 0 = \dfrac{3}{4}x - y - 2$

$2x = 18$

$\dfrac{2x}{2} = \dfrac{18}{2}$ $4\left[\dfrac{3}{4}x - y - 2\right] = [0]4$

$x = 9$ $3x - 4y - 8 = 0$

$3x - 8 = 0$

$3x = 8$

$\dfrac{3x}{3} = \dfrac{8}{3}$

$x = 8/3$

Special Cases of the equation Ax+By+C=0, **when one or more of A, B, C are 0.**

Ax+By=0 **is a line that passes through the origin (0,0)**

By+C=0 **is a horizontal line.**

Ax+C=0 **is a vertical line.**

(0,0)

Example 5:

Describe each of the following lines. Identify the intercepts, then state the domain and range.

$m = \dfrac{-A}{B}$

$m = \dfrac{-1(1)}{-3}$

$m = \dfrac{1}{3}$

a) 1x - 3y = 0   y=0 x=0

missing C term   goes through origin

b) 2y + 4 = 0   missing Ax term   horizontal line

$\dfrac{2y}{2} = \dfrac{-4}{2}$

$y = -2$

c) 3x - 12 = 0   missing By term

$\dfrac{3x}{3} = \dfrac{12}{3}$

$x = 4$

m = undefined   vertical line

a) D x ∈ R
   y ∈ R

b) -∞ < x, y < ∞

c) x = 4

(0,0)

(4,0)

(0,-2)

b) D: x ∈ R
   R y = -2

c) D: x = 4
   R y ∈ R

105

B
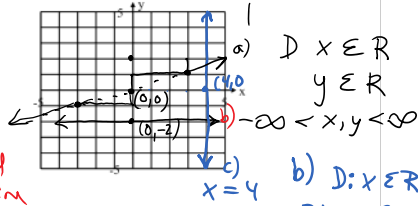
Example 6:

Brook wants to save $336 to decorate her bedroom. She has two part-time jobs. On weekends, she works as a snowboard instructor and earns $12 per hour. On weeknights, she earns $16 per hour working as a high-school tutor.

a) Write an equation to represent the number of ~~house~~ hours Brooke needs to work as a snowboard instructor, S, and as a tutor, T.

$\$12/h \rightarrow S$ $\$16/h \; T$

h • rate

Earning + Earning

$12S + 16T = 336$

b) What is the S-intercept of a graph of the equation? What does the S-intercept represent?

$T = 0$ $12S + \cancel{16T} = 336$

$\dfrac{12S}{12} = \dfrac{336}{12}$

$S = 28$

28 hours would be required as a snowshoe instructor if Brook does not tutor.

c) What would the T-intercept be? What does it represent?

$S = 0$ $\dfrac{12(0) + 16T}{16} = \dfrac{336}{16}$

$T = 21$

21 hours worked as a tutor without snowboard instructing earns $336.

d) Suppose Brooke works 8h as a snowboard instructor. How many hours will she need to work as a tutor?

$S = 8$

$T = $ # of tutor hours.

$12S + 16T = 336$

$12(8) + 16T = 336$

$96 + 16T = 336$

$-96 \qquad\qquad -96$

$\dfrac{16T}{16} = \dfrac{240}{16}$

$T = 15$

Brook will need to work 15 hours as a tutor if she instructs boarding for 8 hours.

Textbook: ✓ graph paper.

$\boxed{A}x + by + c = 0$

+ positive
& a whole #

Assignment: Why does a poor man drink coffee + Pg.