7.2 General Form

General Form

> The general form of a linear equation is $Ax + By + C = 0$, where A, B, and C are real numbers, A and B are not both zero, and A is a whole number.

Example: Write each equation in general form.

$$3\,y = \left(-\frac{2}{3}x + 6\right)3$$

$3y = -2x + 18$

$2x + 3y - 18 = 0$

$$4\,y = \left(\frac{3}{4}x - 2\right)4$$

$4y = 3x - 8 \quad \rightarrow \quad 4y = 3x - 8$

$0 = 3x - 4y - 8 \quad (-3x + 4y + 8 = 0)^{(-1)}$

$3x - 4y - 8 = 0 \qquad 3x - 4y - 8 = 0$

> - To determine the y-intercept of an equation in standard form, substitute $x = 0$ and solve for y.
> - To determine the x-intercept of an equation in standard form, substitute $y = 0$ and solve for x.
> - Using the intercepts, the graph can then be drawn.

Example: Determine the intercepts and graph the line given by each equation.

$2x - 3y - 6 = 0$

y-int: x=0
$2(0) - 3y - 6 = 0$
$-3y - 6 = 0$
$\;+6 \quad +6$
$-3y = 6$
$\div -3 \quad \div -3$
$y = -2$

x-int: y=0
$2x - 3(0) - 6 = 0$
$2x - 6 = 0$
$\;+6 \quad +6$
$2x = 6$
$\div 2 \quad \div 2$
$x = 3$

$4x + 5y - 20 = 0$

y-int: x=0
$4(0) + 5y - 20 = 0$
$5y - 20 = 0$
$\;+20 \quad +20$
$5y = 20$
$\div 5 \quad \div 5$
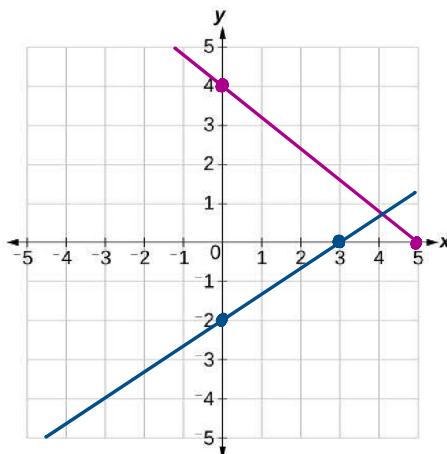$y = 4$

x-int: y=0
$4x + 5(0) - 20 = 0$
$4x - 20 = 0$
$\;+20 \quad +20$
$4x = 20$
$\div 4 \quad \div 4$
$x = 5$

Horizontal and Vertical Lines

Complete the table.

Linear Relation	Sketch	*x*-intercept	*y*-intercept	Domain	Range
$y - 3 = 0$ $y = 3$		none	3	$\{x \in \mathbb{R}\}$	$\{3\}$
$x + 4.5 = 0$ $x = -4.5$		-4.5	none	$\{-4.5\}$	$\{y \in \mathbb{R}\}$
$y = 0$ (*x*-axis)		all real numbers are included	0	$\{x \in \mathbb{R}\}$	$\{0\}$

Application

A laptop has 66 GB of disk space available. Suppose a one-hour show uses 1.1 GB of disk space and a movie uses 4.4 GB. Write a linear equation that represents the number of tv shows, *T*, and movies, *M*, that can be stored on the laptop.

1·hour

$$1.1T + 4.4M = 66$$

Determine the intercepts. What does each represent?

T-intercept: $1.1T + 4.4(0) = 66$
$1.1T = 66$
$\div 1.1 \quad \div 1.1$
$T = 60$ ← max # of TV shows

M-intercept: $1.1(0) + 4.4M = 66$
$4.4M = 66$
$\div 4.4 \quad \div 4.4$
max # → $M = 15$ of movies

Up to 60 TV shows and up to 15 movies can be stored.

If 16 shows are stored, how many movies is there space for?

$\hookrightarrow T = 16$

$1.1(16) + 4.4M = 66$
$17.6 + 4.4M = 66$
$-17.6 \qquad -17.6$
$4.4M = 48.4$
$\div 4.4 \quad \div 4.4$
$M = 11$

There is space for 11 movies.

Assignment: p.148 #1 – 3, 5 – 7