Lesson 14 – General and Standard Form

Goal:
- Can graph equations in general or standard form.
- Can build an equation for a linear function in general or standard form.
- Can use applications to model situations in general or standard form.

New Terminology:
- General Form
- Standard form

Discuss: Graph the line

$3x - 5y + 9 = 0$

What strategy are you using?

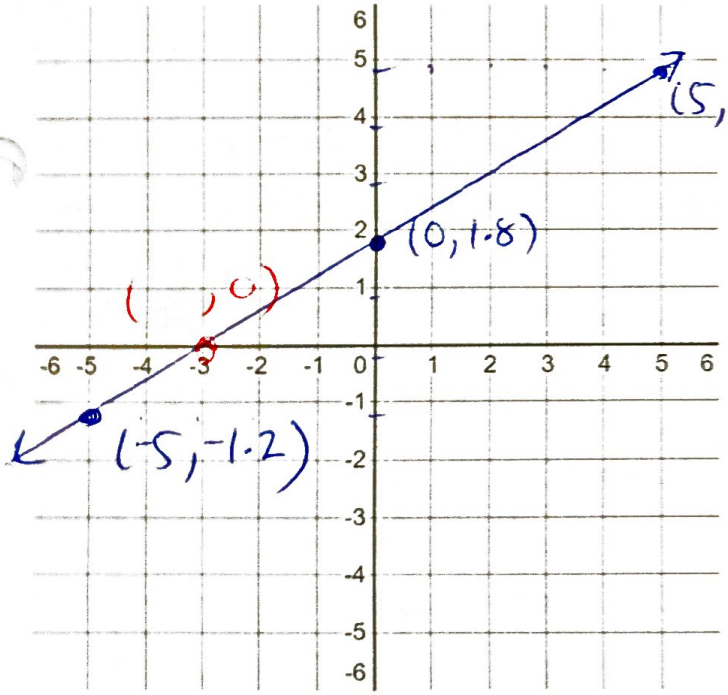
$y = f(x)$

$-3x \quad -3x$

$-5y + 9 = -3x$

$-5y = -3x - 9$

$y = \frac{3}{5}x + \frac{9}{5} = f(x)$



connect points because it's continuous, it's a line ☆ domain $x \in \mathbb{R}$ and it's a smooth operation just times by 3, divide by 5 and add

Why might the given form be nicer than slope-intercept?

→ we can solve for x or y

→ no fractions nice integers for _____

→ find x-intercept / y-intercept quickly by letting $y=0$ or $x=0$

Lesson 14

We know how that using slope-intercept form is very useful and natural since it is in function form; however, it relies that the slope is well defined which we saw last class is not always the case.

Therefore, the **GENERAL FORM** is the general way of writing the equation of a line:

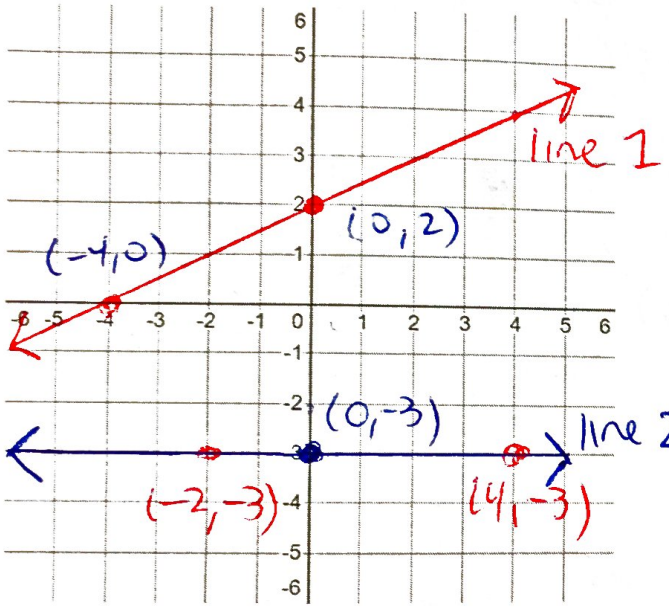
$$Ax + By + C = 0$$

Where $A \geq 0$ and $B, C \in \mathbb{R}$

You already know how to graph a line in this form by changing it to slope-intercept form, but we can very easily graph it using the intercepts.

Example: Graph the lines

$x - 2y + 4 = 0$ ← line 1
$y + 3 = 0$ ← line 2

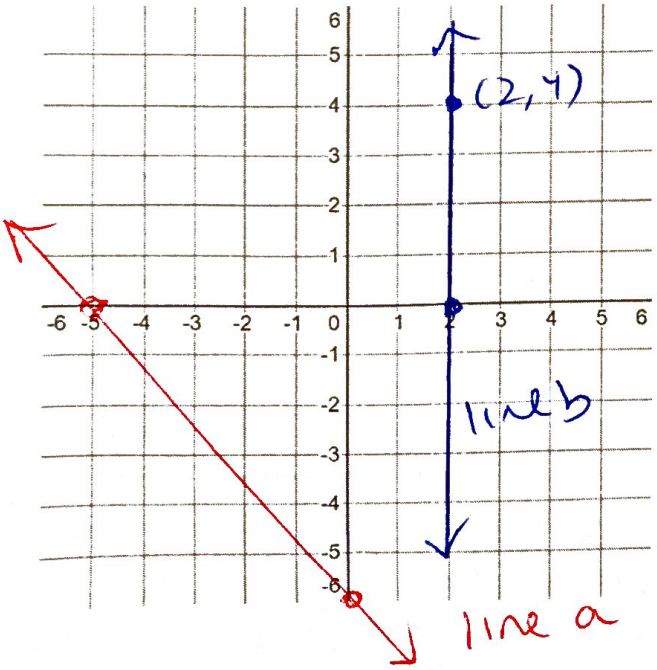


line 1: set $x=0 \Rightarrow -2y+4=0$, $y=2$
$y=0 \Rightarrow x+4=0$, $x=-4$
$(0,2)$
$(-4,0)$

line 2: set $x=0 \Rightarrow y+3=0$, $y=-3$
$(0,-3)$ $y=0 \Rightarrow 3=0$ for any $x \in \mathbb{R}$
$\Rightarrow \Leftarrow$ impossible

Practice: Graph the following lines and label the x, y-intercepts.

$6x + 5y + 30 = 0$ → line a
$x - 2 = 0$ → line b



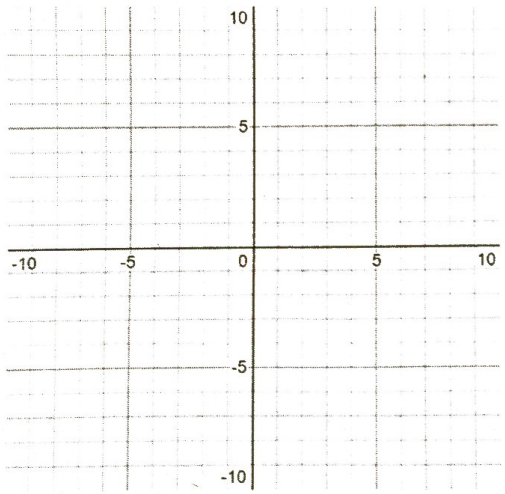
line a set $x=0 \Rightarrow 5y+30=0$, $y=-6$
$(0,-6)$
$y=0 \Rightarrow 6x+30=0$, $x=-5$
$(-5,0)$

line b set $x=0 \Rightarrow -2=0$
$\Rightarrow \Leftarrow$
$y=0 \Rightarrow x-2=0$, $x=2$
$y \in \mathbb{R}$ ↑

→ easier

Chapter 7 Linear Functions Lesson 14

Discuss: Determine the general form of the line that has an x-intercept of 3 and a y-intercept of 7.



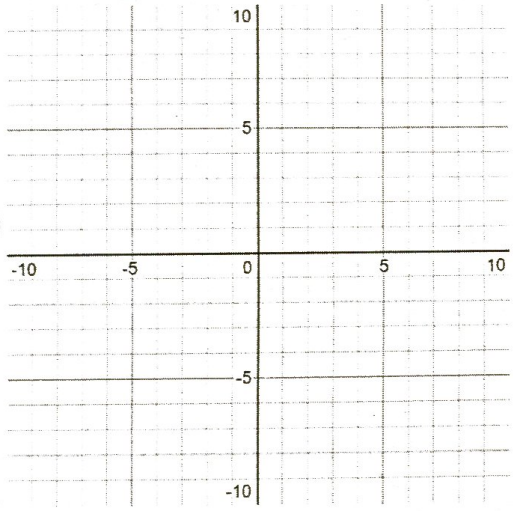
could backdoor

$Ax + By + C = 0$

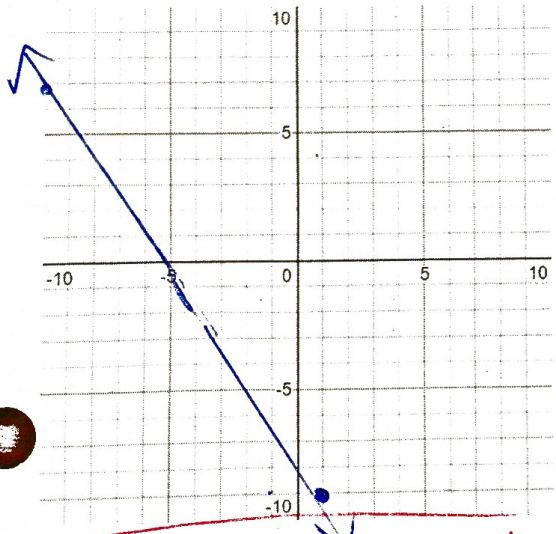
y-int x-int. lcm(x,y)

$7x + 3y - 21 = 0$

Discuss: Determine the general form of the line that passes through the point (3,1) and has a slope of $\frac{5}{4}$.



Discuss: Determine the general form of the line that passes through the points $(1,-9)$ and $(-10,7)$.



★ find slope-intercept form convert to general

$$m = \frac{\Delta y}{\Delta x} = \frac{7+9}{-1-10} = -\frac{16}{11}$$

$$y = -\frac{16}{11}x + b$$

$$-9 = -\frac{16}{11}(1) + b \Rightarrow b = -\frac{83}{11}$$

$$\left[y = -\frac{16}{11}x - \frac{83}{11}\right] \times 11$$

$16x + 11y + 83 = 0$

Notice that when we are solving for the intercepts, we consistently move the constant to the right side of the equation. This is called **STANDARD FORM:**

$$Ax + By = C$$

Where $A \geq 0$

This is basically the same thing as general form, it just has the constant move on the opposite side as the variables. Since general form allows us to use the intercepts effectively it is useful in applications that involve the combination of two things adding to a fixed total.

Example: For a Christmas work party we have $210 to spend on gift cards that come in $10 and $25 varieties. Determine an equation for the number of each gift card that can be bought.

let n be the # of $10 gift cards
let w be the # of $25 gift cards

$$\$210 = \$10n + \$25w$$

$10 n	w $25
1	8
—	7
6	6
11	4
16	2
21	0

+5 (\$60) −2 (\$150) −5 (\$110) −2 (\$100)

Domain: $n \in \{1, 6, 11, 16, 21\}$

Range: $w \in \{y \in \mathbb{N} \mid y \text{ is even and } y \leq 8\}$

Practice: You decide to go on a no carb diet and get all your calories from protein and fat. Your diet recommends 1800 calories each day. If 1 g of protein is 4 calories and 1 g of fat is 9 calories, determine an equation for the amount of protein and fat you can eat each day.

let p be the mass of protein (g)
and f be the mass of fat (g)

$$1800 = 4p + 9f$$

Domain: $p \in [0, 450]$
Range: $f \in [0, 200]$

Discuss: What are the domain and range of these equations?

Assigned Problems: 7.2 page 365 – 369 # 2-8, 10, 11, 13, 14, 16, 20

12, 15, 19

Key Ideas on page 364