

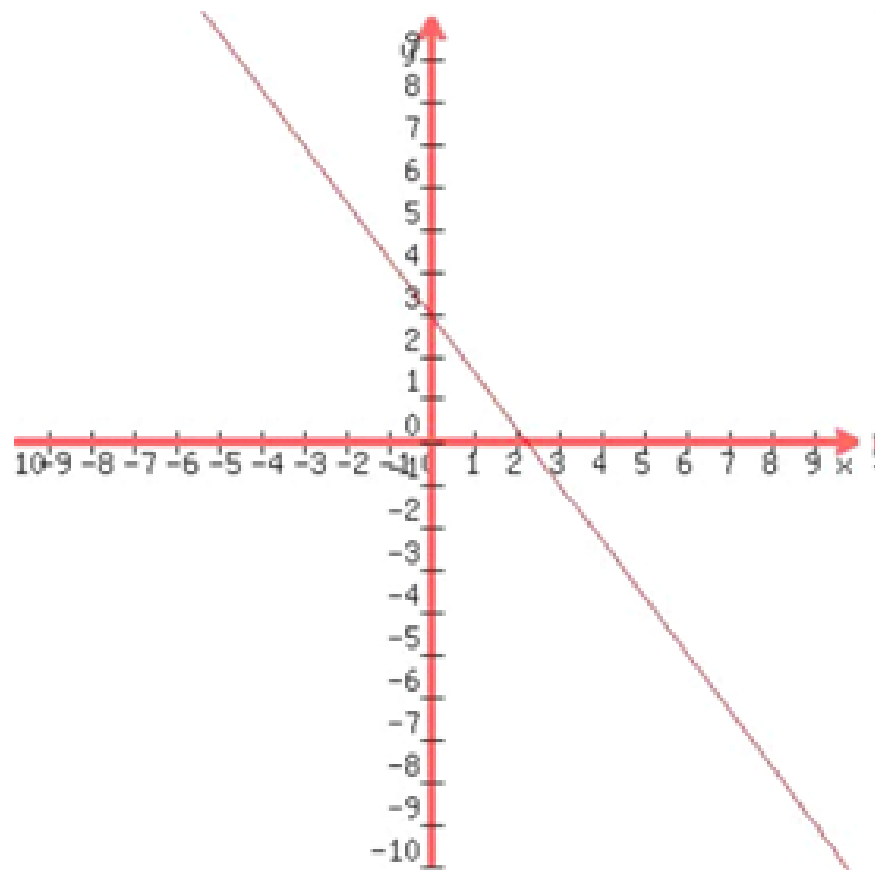
Linear Equations, Slope, and X & Y Intercepts

Objectives:

- ~ Find the Slope of a line
- ~ State whether an equation is Linear
- ~ Find x and y intercepts of a line
- ~ Graph a line by x and y intercepts

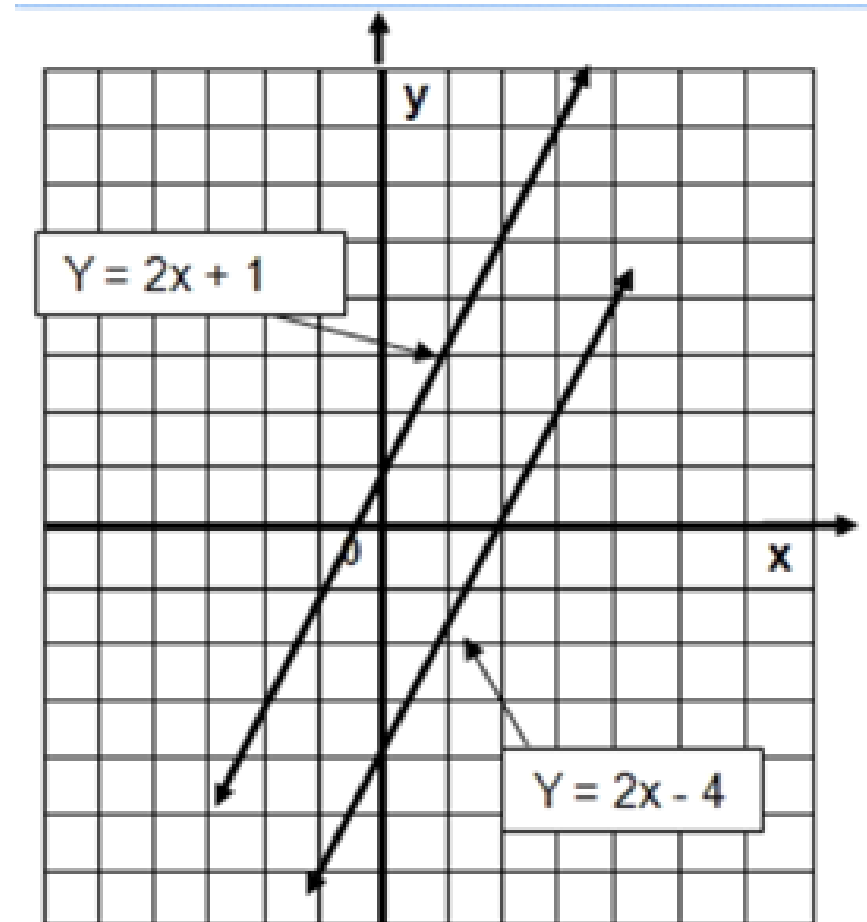
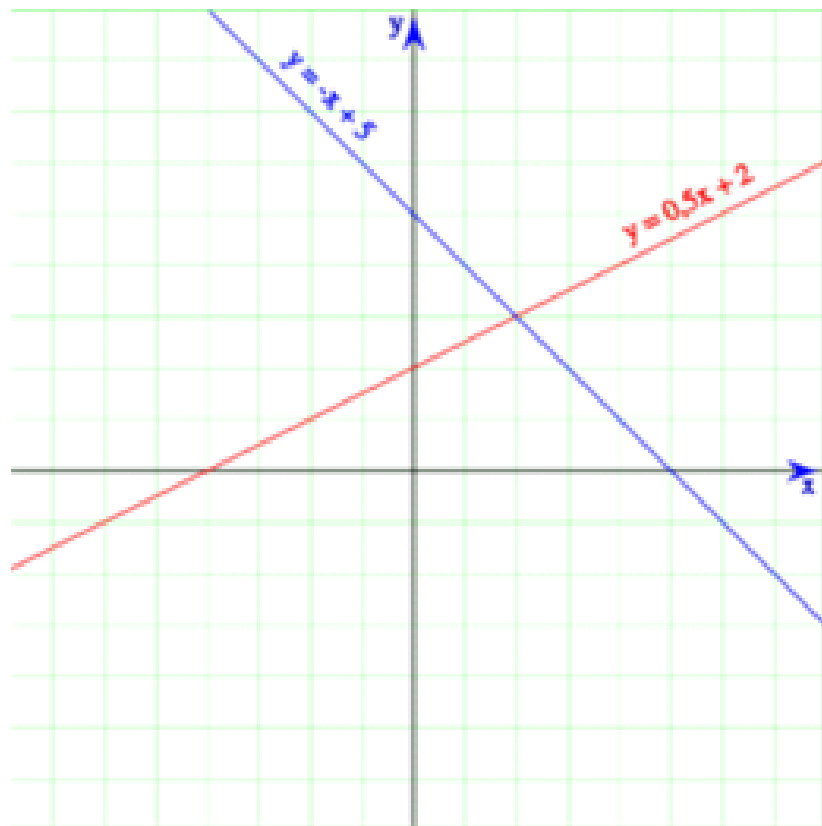
Lesson 6: Section 2.2 & 2.3

Linear Equations: when graphed, a linear equation forms a straight line.



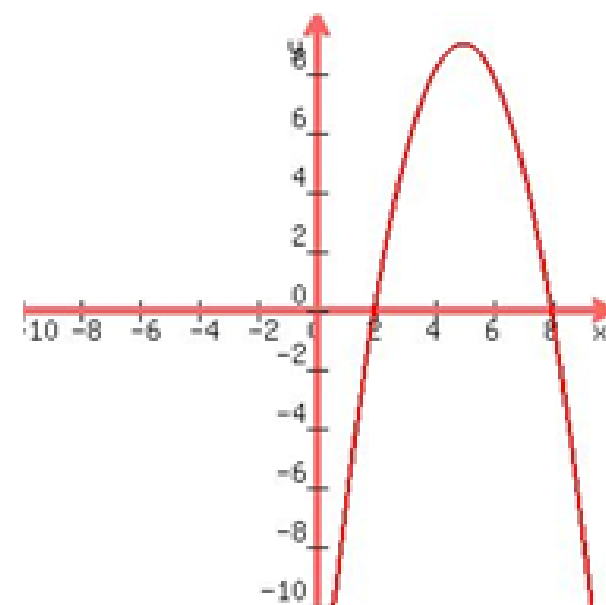
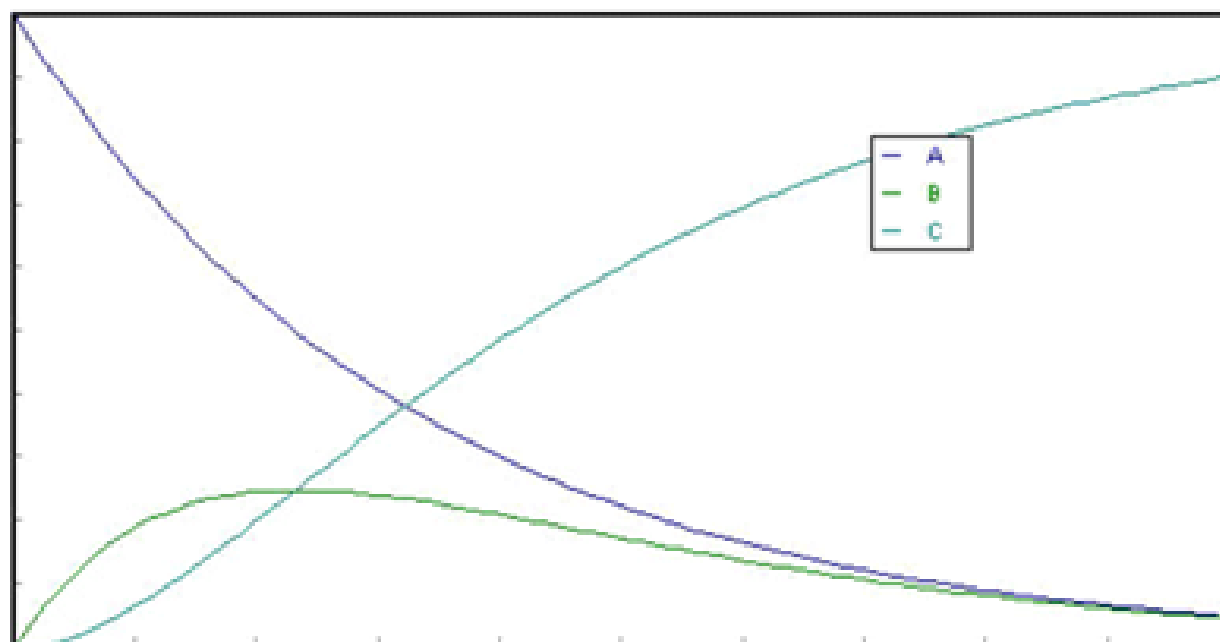
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Graph examples:



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Graph Non-examples:



How can we tell from just an equation?

A linear equation needs to have one or two variables. They are usually “x” and “y”. You cannot have more than two variables.

Standard Form: $Ax + By = C$,
where A, B, C are Real numbers and A, B are not 0

How can we tell from just an equation?

A linear equation CANNOT have:

- Powers (exponents) on variables x^2, y^2
- Square roots on variables \sqrt{x}, \sqrt{y}
- Dividing by variables $\frac{3}{x}, \frac{4}{y}$
- Multiplying variables xy
- Variables in the denominator of a fraction

Linear Equation Examples:

$$y = 5x - 7$$

$$3y = 4^2x$$

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

$$7n - 8m = 4 - 2m$$

$$3^2x + 4y = 1$$

$$42y + 21x = 14$$

Linear Equation Non-Examples:

Why do these not work?

$$y = 5xy - 10$$

multivar.

$$42y^2 + 21x^2 = 14$$

powers on var.

$$y = \frac{3}{x}$$

var in bottom

$$3y = 4x + 3z$$

3 variables

$$3x^2 + 4y = 1$$

power on variable

$$8m = 4 - 2m^2$$

power on variable

Your turn: Linear Equation or not?

a.) $y = 3x + x$ linear

b.) $x = \frac{1}{y}$ non-linear, divided by variable

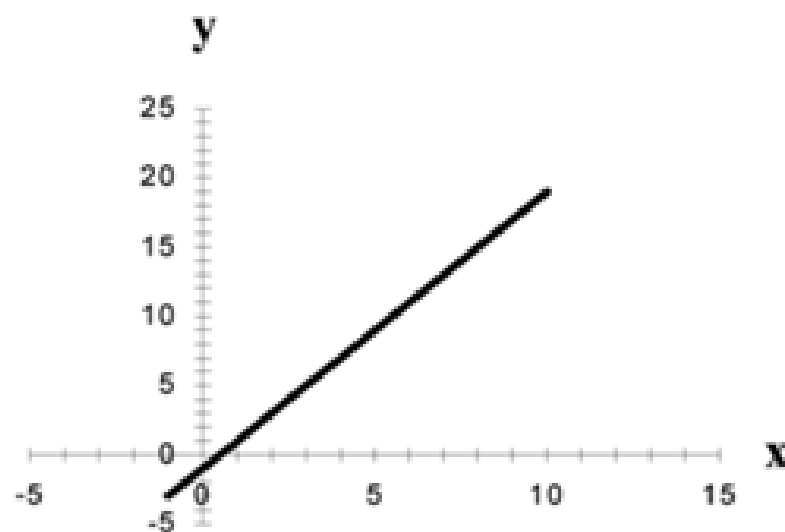
c.) $4y = 3x + yx$ non-linear, mult $x \cdot y$.

d.) $10^2 y - 3x = 2$ linear.

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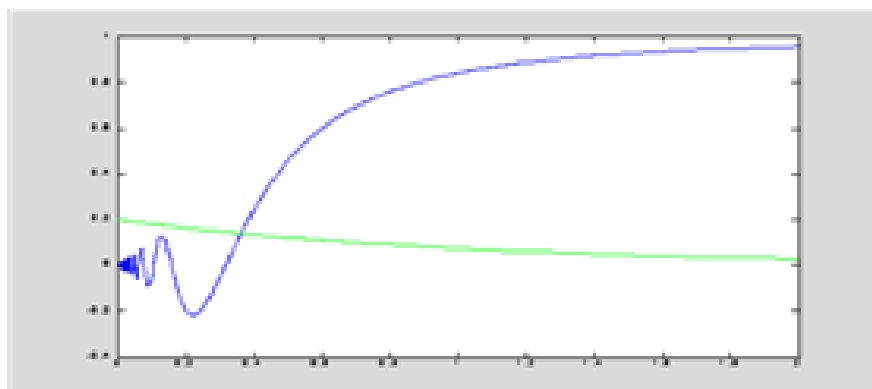
Your turn: Linear Equation or not?

a.)



linear

b.)

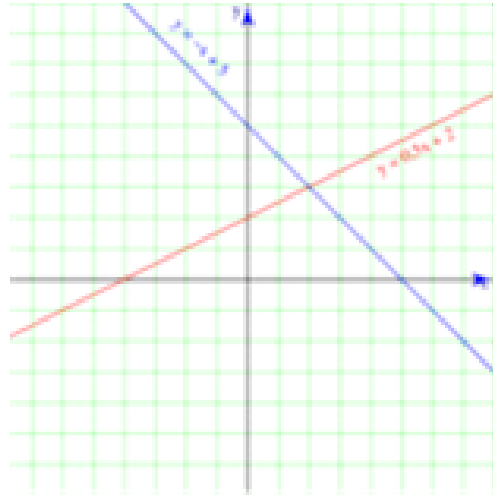


non-linear

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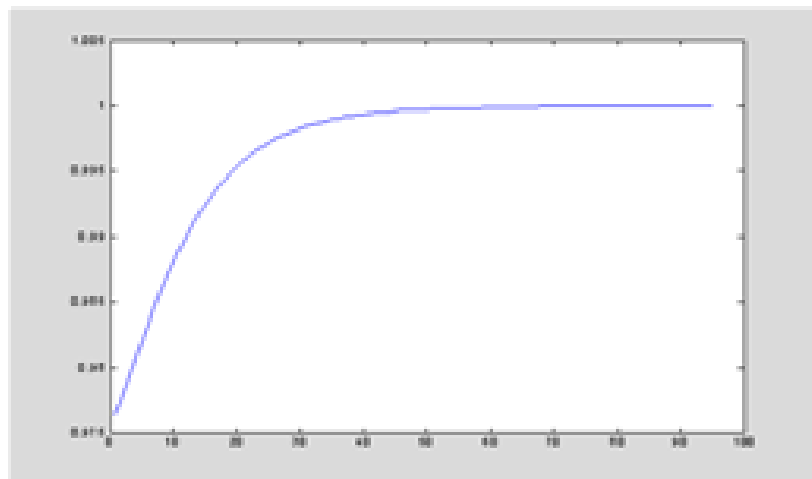
Your turn: Linear Equation or not?

a.)



linear

b.)



non-linear

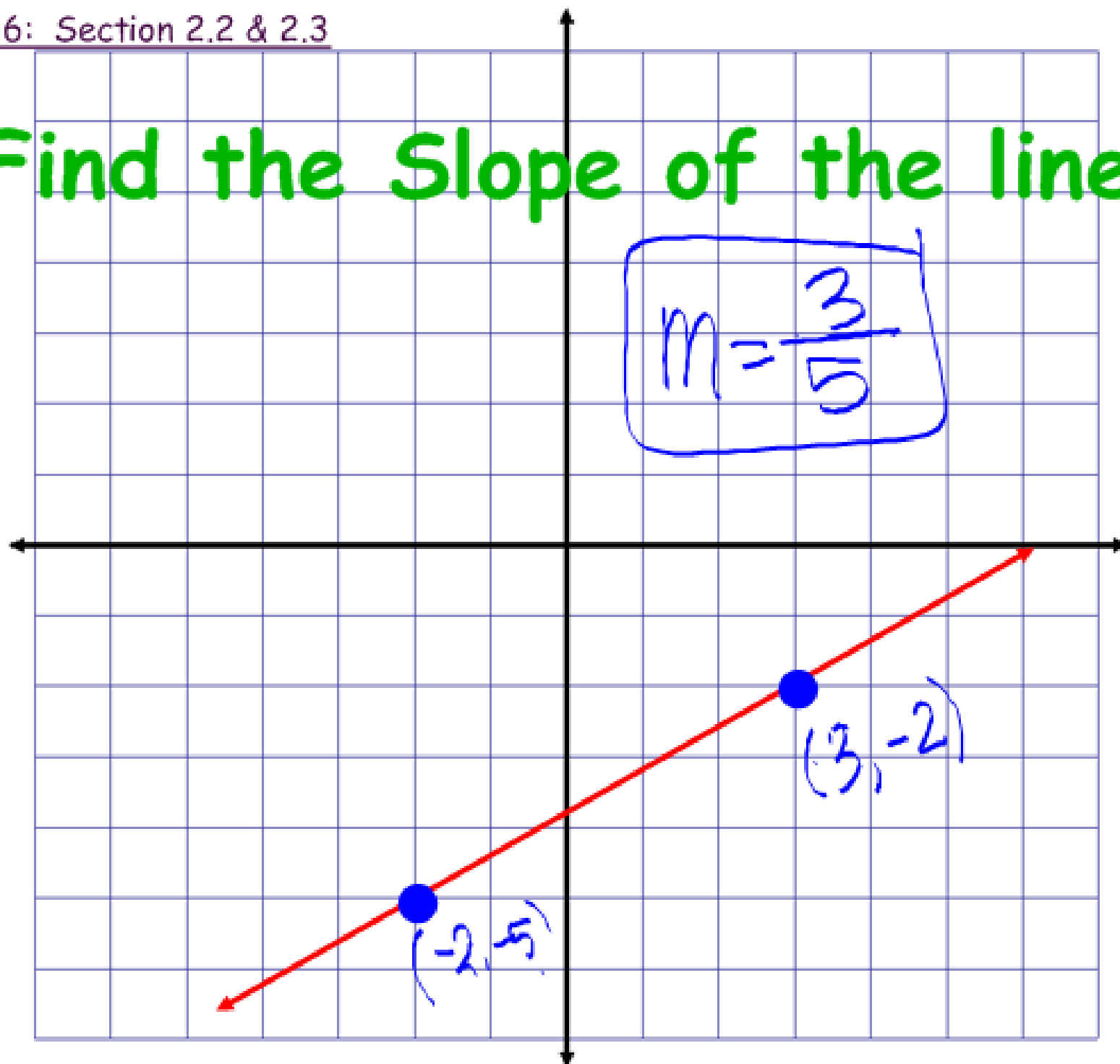
Slope = m

(x_1, y_1)
 (x_2, y_2)

$$m = \frac{\text{Rise}}{\text{Run}}$$

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

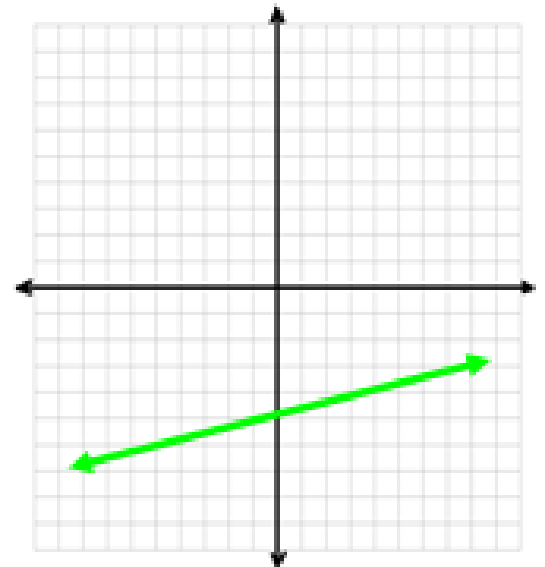
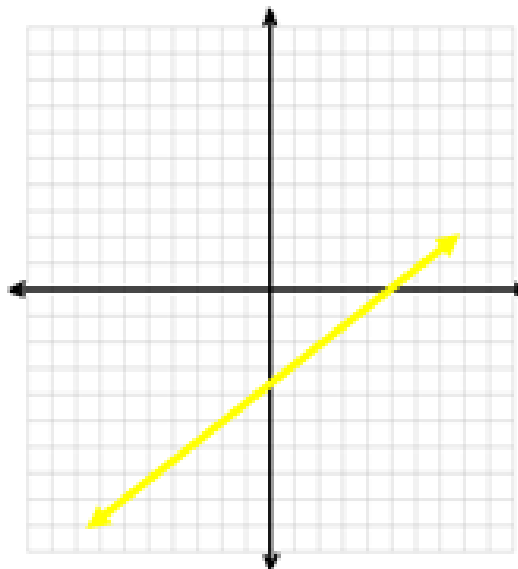
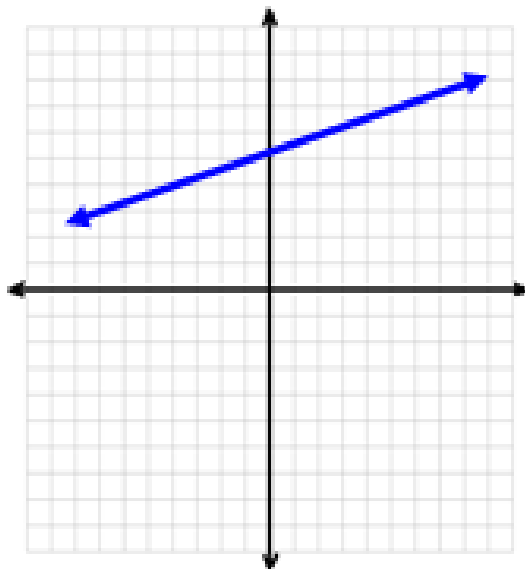
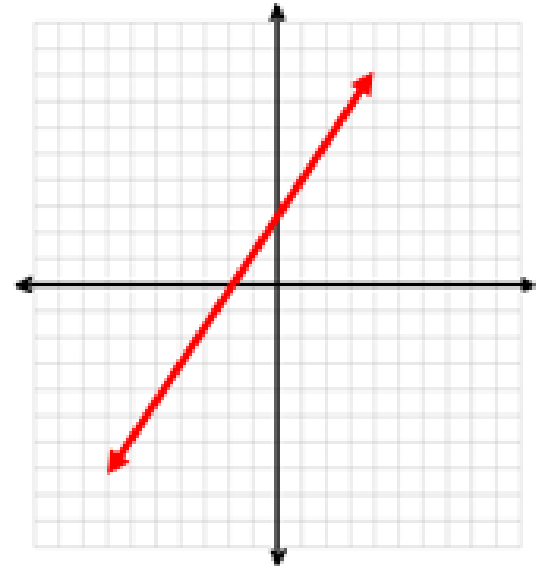
Find the Slope of the line.



Lesson 7: Section 2.3 & 2.4 - Slope Intercept Form

Positive Slope Graphs (Increasing or Rising)

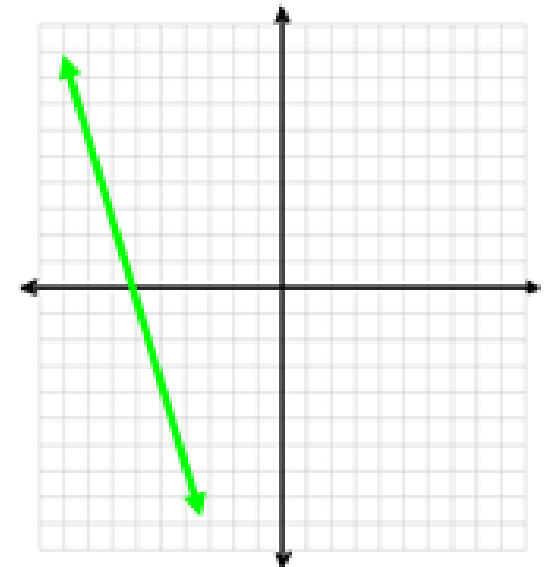
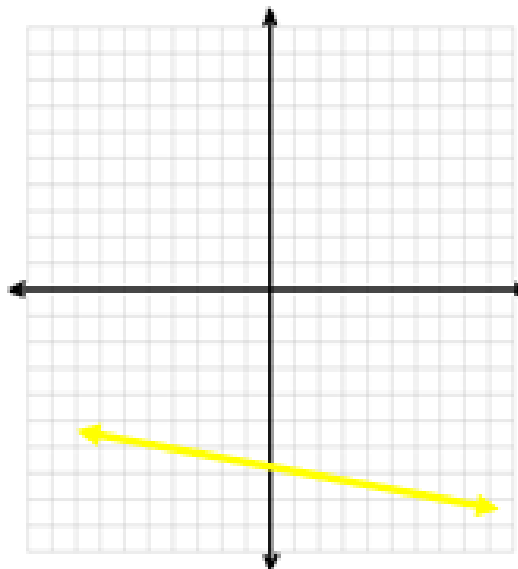
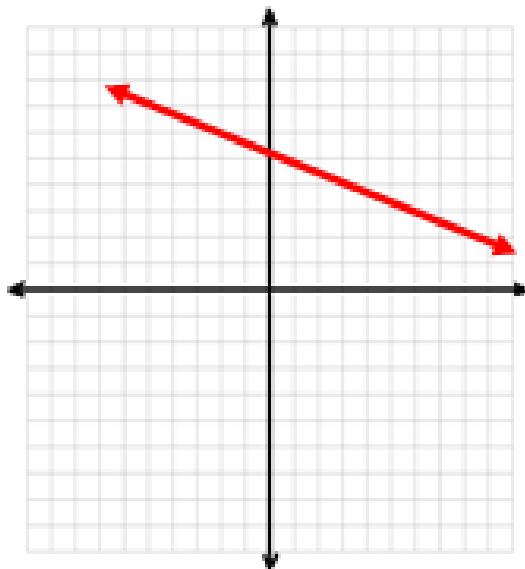
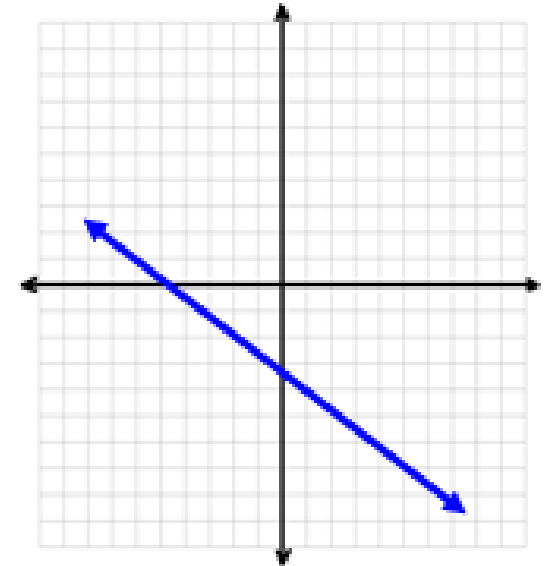
$$m > 0$$



Lesson 7: Section 2.3 & 2.4 - Slope Intercept Form

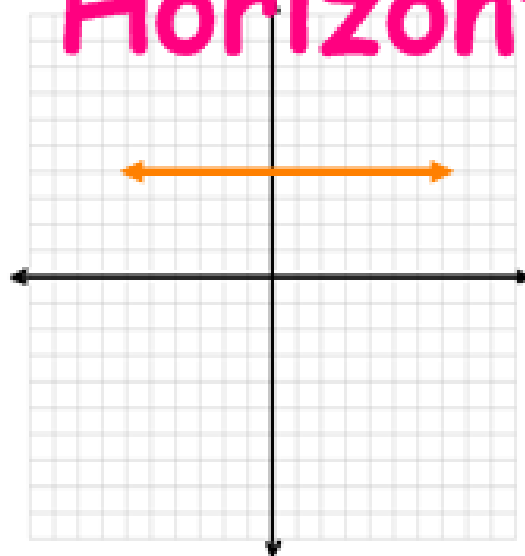
Negative Slope Graphs (Decreasing or Falling)

$$m < 0$$

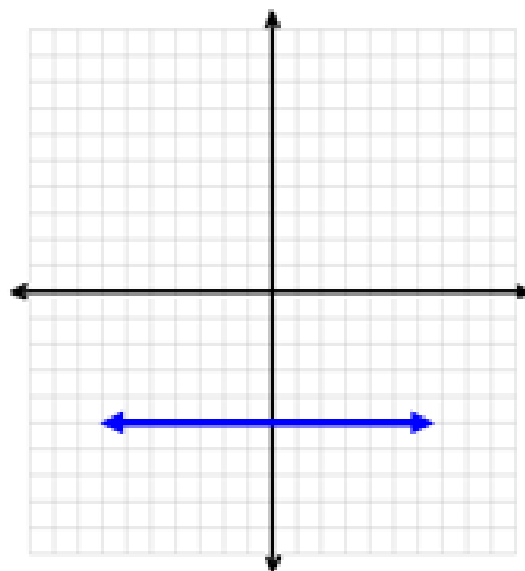


$m = \text{undef.}$

$m=0$
Slope=0 Graphs
Horizontal



$y = 4$



$y = -5$

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

$m = 0$

No Slope Graphs
(Undefined Slope)

v

e

r

t

i

c

a

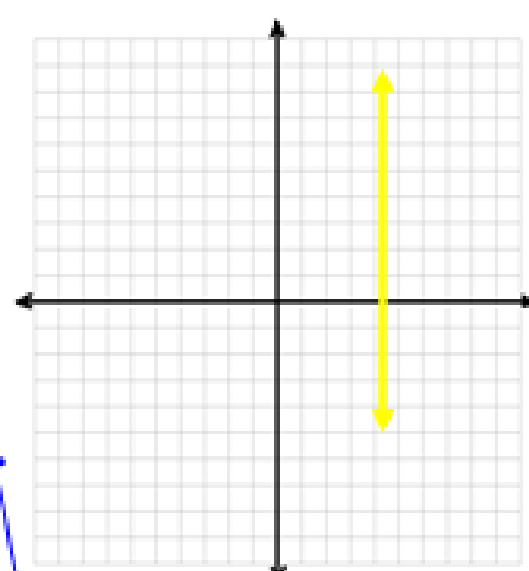
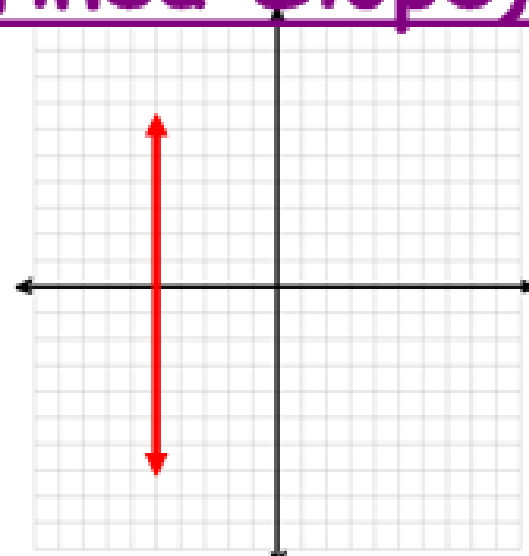
l

$x = -5$

$x = 4$

$m = \frac{3}{0}$

$m = \text{undef.}$



Lesson 6: Section 2.2 & 2.3

Example 1:

Find the Slope of the line that passes through the points $(3, 4)$ and $(6, -8)$.

x_1 y_1

x_2 y_2

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

$$m = \frac{-8 - 4}{6 - 3} = \frac{-12}{3} = -4$$

$m = -4$
falling

Lesson 6: Section 2.2 & 2.3

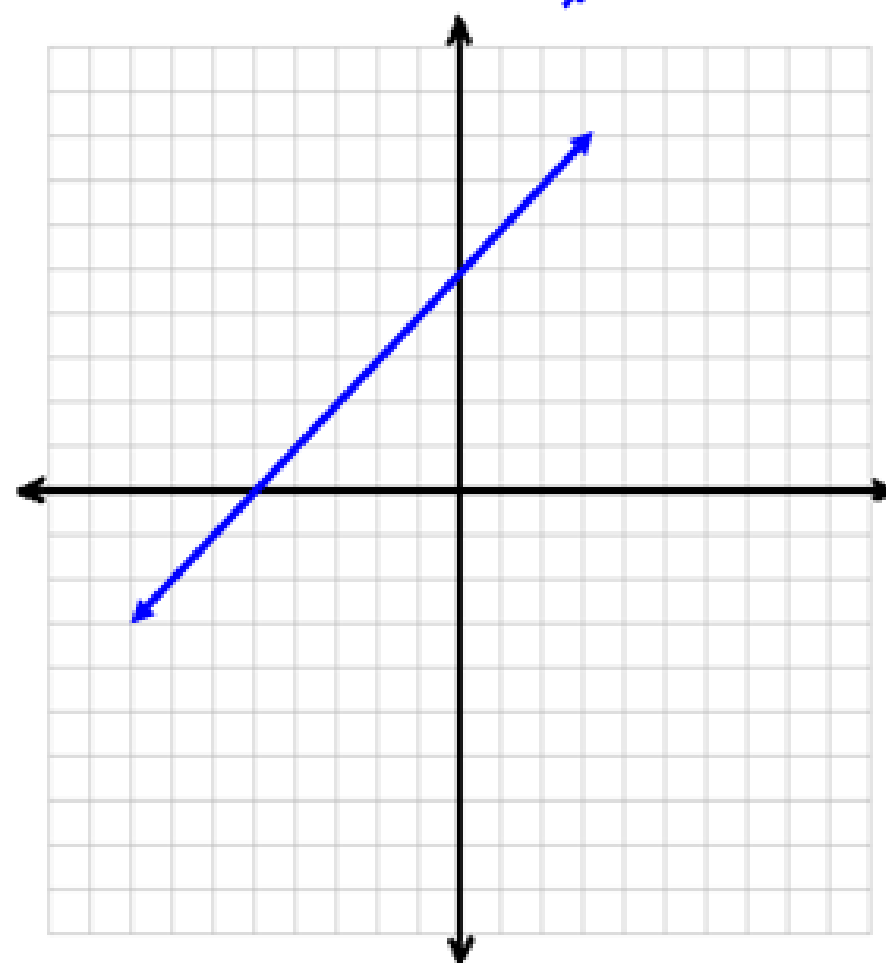
Example 2:

Find the intercept points.

(Where the graph crosses each axis.)

x- intercept: $(-5, 0)$

y- intercept: $(0, 5)$



But how do we find the intercept point without a picture?

- When looking for the **y-intercept**, plug a zero in for X and solve for Y. *write in point form.*
- When looking for the **x-intercept**, plug a zero in for Y and solve for X. *write in point form.*

Lesson 6: Section 2.2 & 2.3

Example 3:

Find the x-int and y-int of $2x + y = 6$
and graph.

x-intercept:

- Plug in a zero for y
- Solve for x

$$\underline{x\text{-int: } (3, 0)}$$

$$\frac{2x + 0}{2} = \frac{6}{2}$$

$$x = 3$$

y-intercept:

- Plug in a zero for x
- Solve for y

$$\underline{y\text{-int: } (0, 6)}$$

$$2(0) + y = 6$$

$$y = 6$$



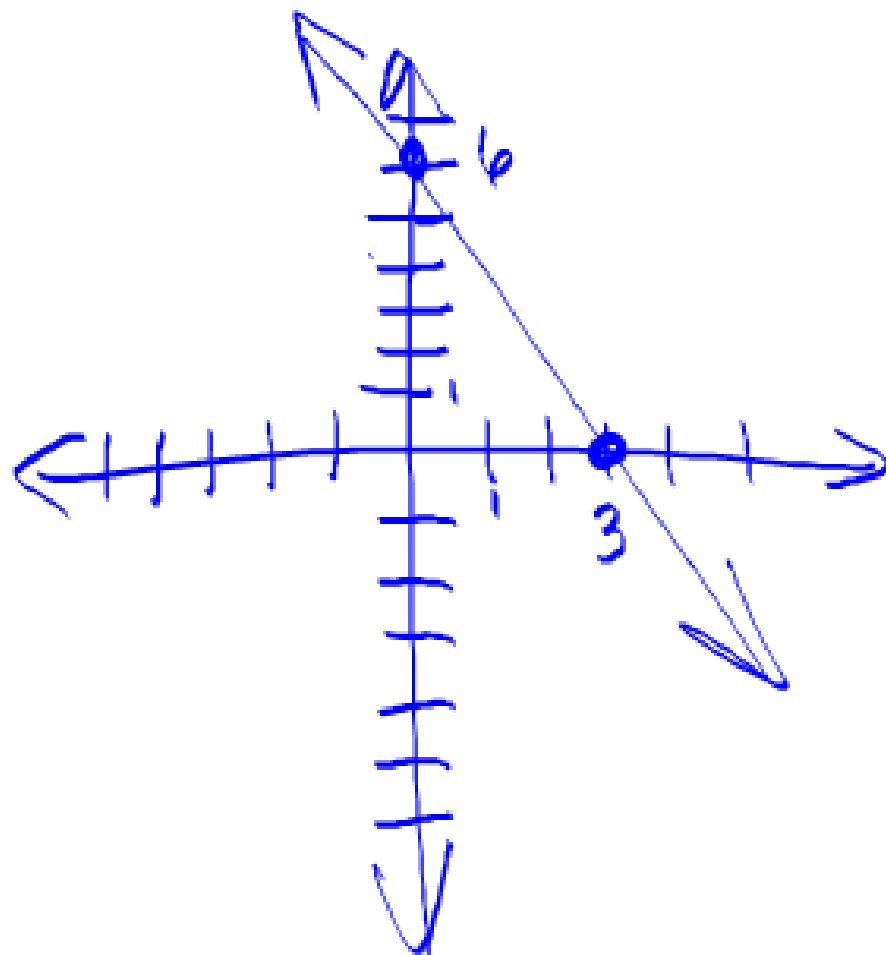
Lesson 6: Section 2.2 & 2.3

Example 3 continued:

Find the x-int and y-int of $2x + y = 6$ and graph.

x-int: $(3, 0)$

y-int: $(0, 6)$



Lesson 6: Section 2.2 & 2.3

Example 4:

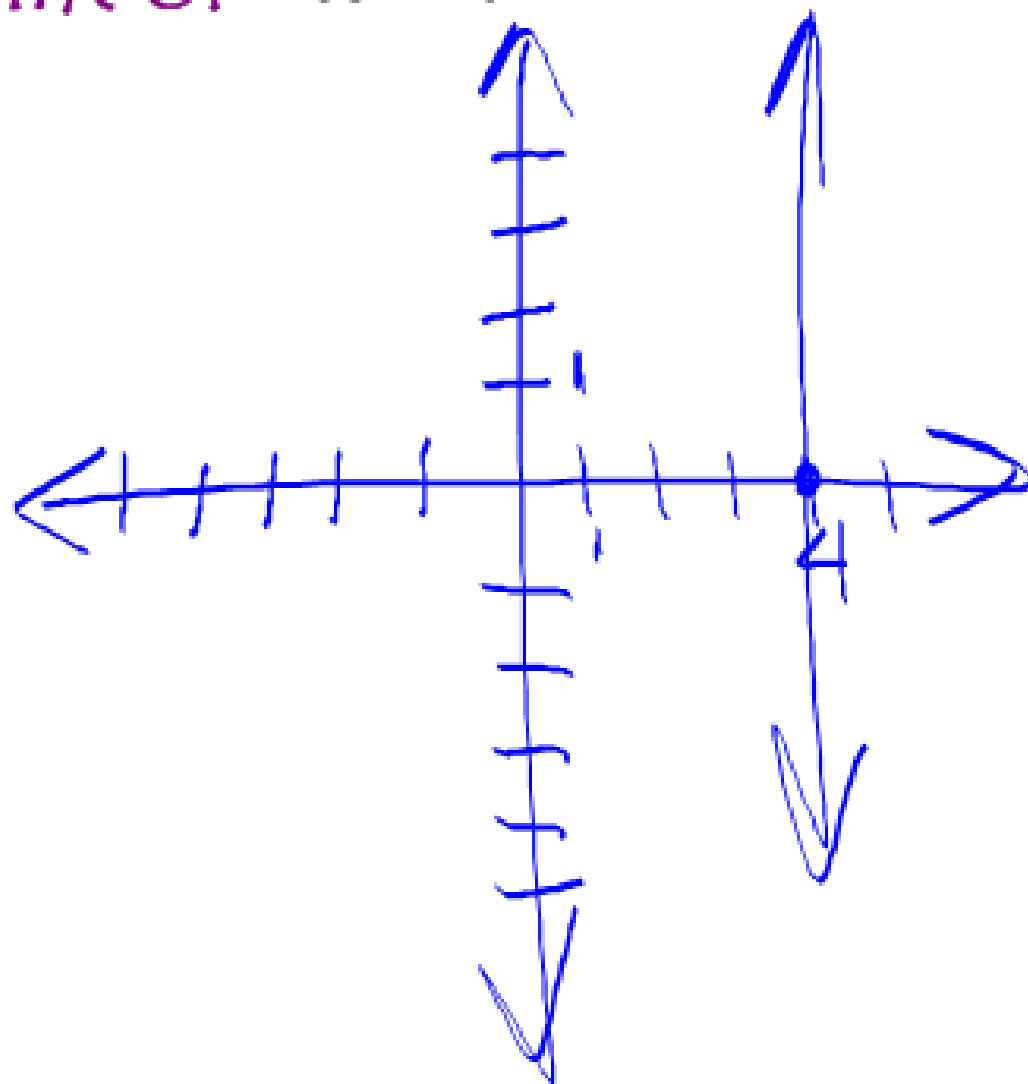
Find the x-int and y-int of $x = 4$
and graph.

x-int: $(4, 0)$

$x = 4$

y-int: none

$0 \neq 4$



Lesson 6: Section 2.2 & 2.3

Example 5:

Find the x-int and y-int of $3x + 4 = 7y$ and graph.

x-intercept:

- Plug in a zero for y
- Solve for x

$$\underline{x\text{-int: } (-\frac{4}{3}, 0)}$$

$$3x + \underset{-4}{4} = \underset{-4}{0}$$

$$\frac{3x}{3} = -\frac{4}{3}$$

$$x = -\frac{4}{3}$$

y-intercept:

- Plug in a zero for x
- Solve for y

$$\underline{y\text{-int: } (0, \frac{4}{7})}$$

$$0 + \frac{4}{7} = \frac{7y}{7}$$

$$\frac{4}{7} = y$$

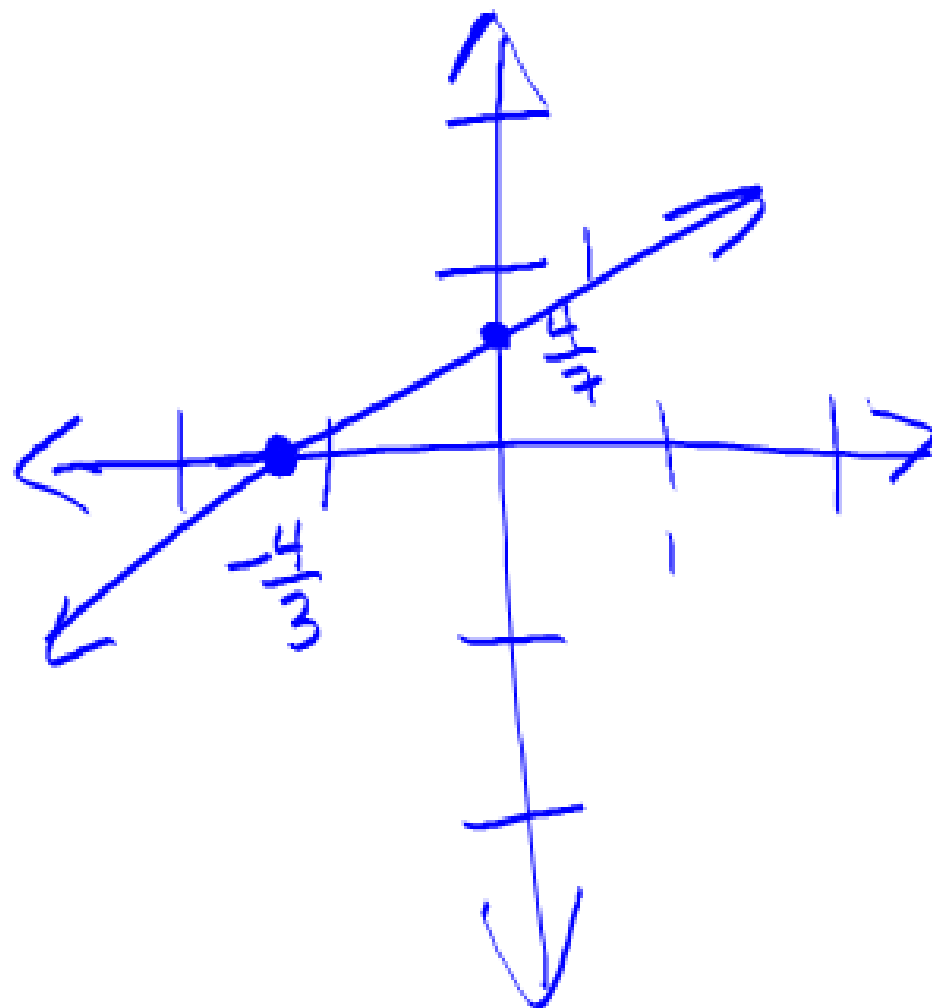
Lesson 6: Section 2.2 & 2.3

Example 5 continued:

Find the x-int and y-int of $3x + 4 = 7y$
and graph.

x-int: $(-\frac{4}{3}, 0)$

y-int: $(0, \frac{4}{7})$



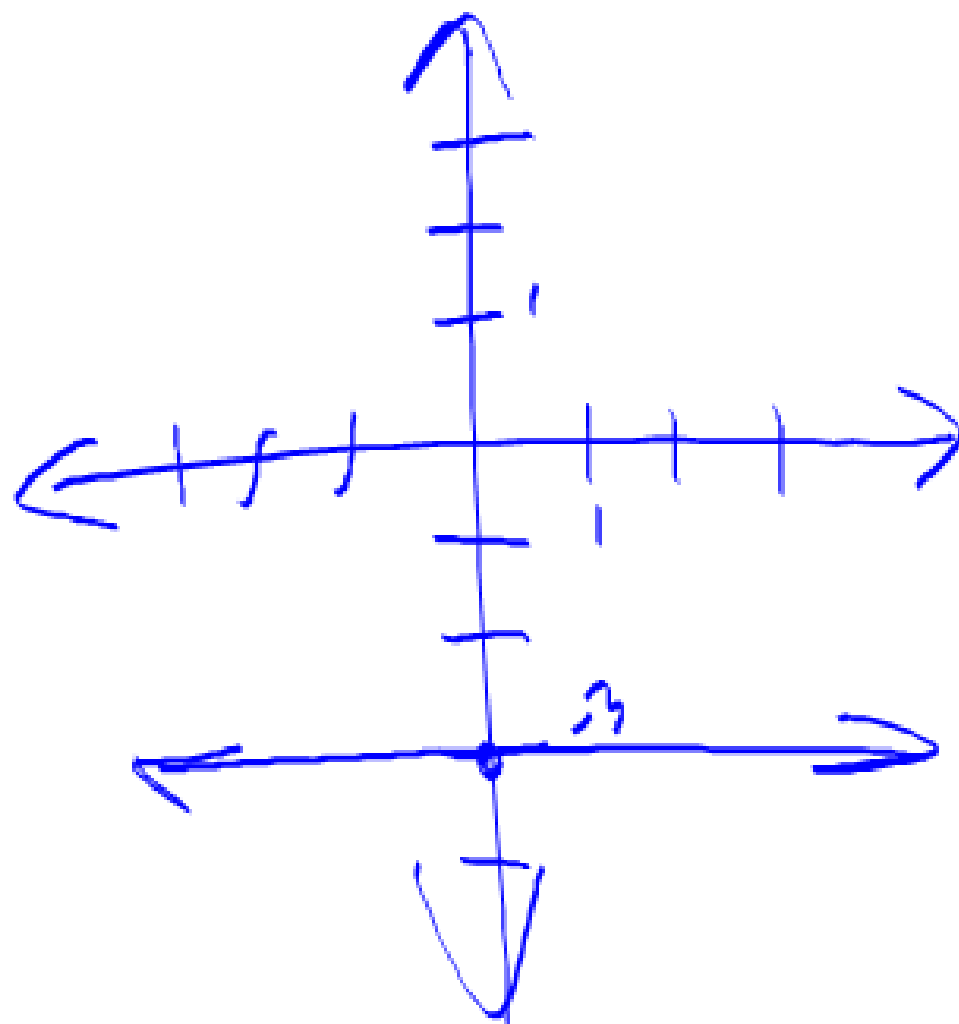
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Example 6:

Find the x-int and y-int of $y = -3$
and graph.

x-int: none

y-int: $(0, -3)$



Can the point of interception on the x-axis and the point of interception on the y-axis ever be the same point?

yes, origin

$(0,0)$

Lesson 6: Section 2.2 & 2.3

- When we only have one point (0,0), we need to pick another X and plug it into the equation to find Y . We now have another point to plot and can connect the points to make a line.

PICK
 (X, Y)

comes from equation

Objectives:

- ~ Find the Slope of a line
- ~ State whether an equation is Linear
- ~ Find x and y intercepts of a line
- ~ Graph a line by x and y intercepts

Can you?

Lesson 6: Section 2.2 & 2.3

Homework:

Assignment 6