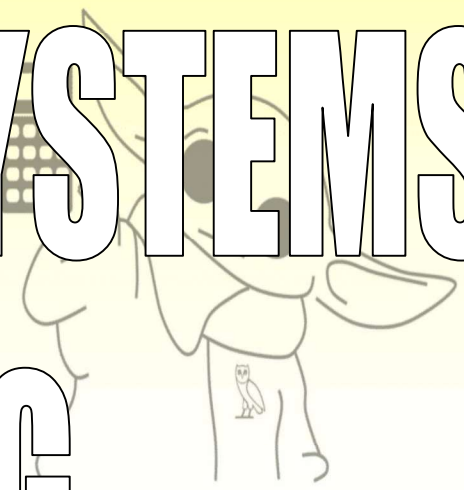
ST. JEAN DE BREBEUF MATHEMATICS

CHAPTER 5.1

SOLVING LINEAR SYSTEMS BY GRAPHING



CHAPTER 5.1 SOLVING LINEAR SYSTEMS BY GRAPHING

KEY CONCEPTS

A **linear system** is a set of two or more linear equations that are considered at the same time

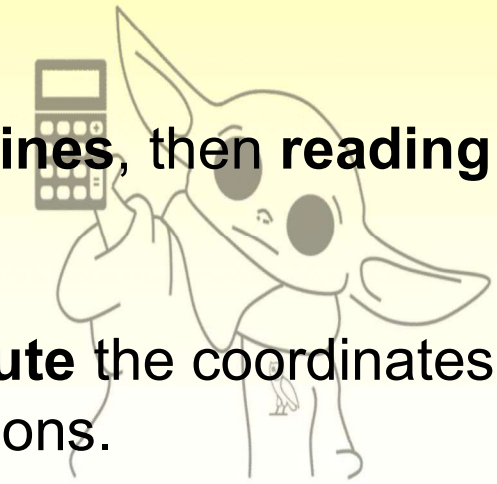
The **solution** to a linear system is the **point of intersection** of the lines.

The *point of intersection* the point at which two lines cross

The coordinates of the point of intersection satisfies both equations

A linear system can be solved by **graphing the lines**, then **reading the point of intersection** from the graph.

To <u>check</u> the solution to a linear system, **substitute** the coordinates of the point of intersection into the original equations.



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CHAPTER 5.1 SOLVING LINEAR SYSTEMS BY GRAPHING

EXAMPLE 1 *Solve a Linear System by Graphing*

(i) For the following linear system:

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

(a) Re-arrange the equations into **slope y-intercept form (y = mx + b)**

EQUATION (1)

$2x + y = 2$

$y = -2x + 2$

$y = mx + b$

m = **– 2**

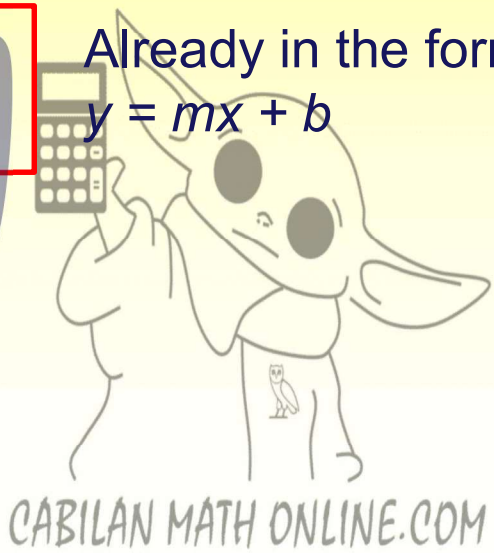
b = **2**

EQUATION (2)

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

$y = mx + b$

Already in the form $y = mx + b$



m = $\frac{-5}{4}$

b = **– 1**

CHAPTER 5.1 SOLVING LINEAR SYSTEMS BY GRAPHING

EXAMPLE 1 *Solve a Linear System by Graphing*

(b) Graph both lines on the same grid. Draw and label the point of intersection.

EQUATION (1)

$y = -2x + 2$

m = **– 2**

b = **2**

Express as a fraction

$\frac{-2}{1}$ ← Down 2

← Right 1

EQUATION (2)

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

$\frac{-5}{4}$ ← Down 5

m = ← Right 4

b = **– 1**

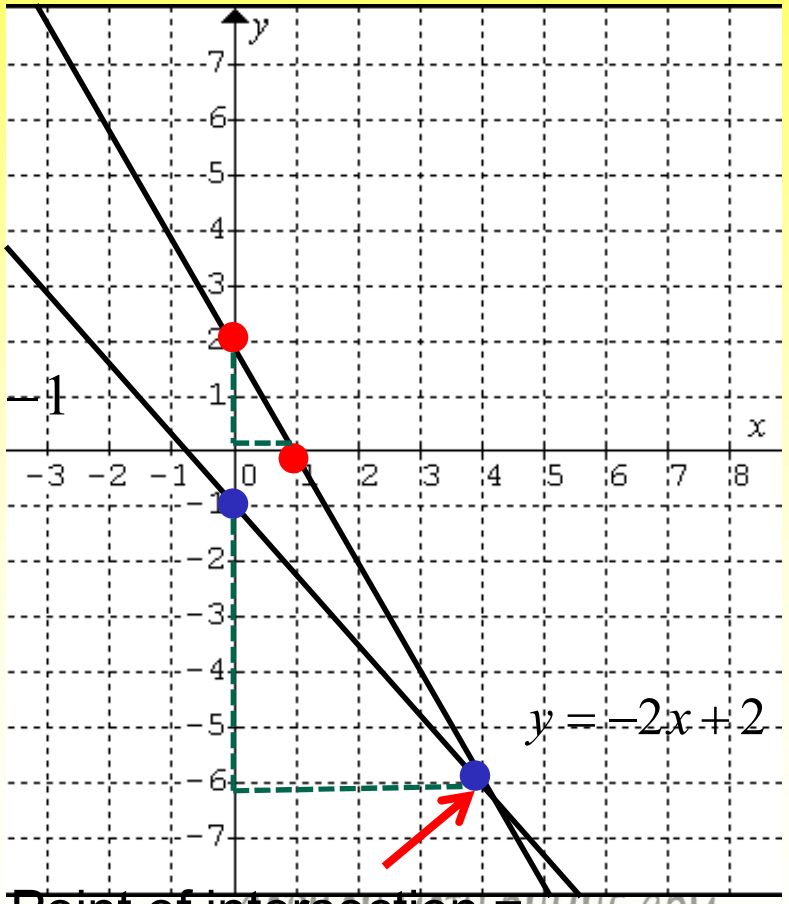
*Plot **y-intercept**

* From y-intercept, use the **slope**

→Perform **rise**

→Perform **run**

→Plot



Point of intersection =

(4, – 6)

CHAPTER 5.1 SOLVING LINEAR SYSTEMS BY GRAPHING

EXAMPLE 1 *Solve a Linear System by Graphing*

(c) Check your solution into **both** original equations

$$2x + y = 2$$

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

EQUATION (1)

x y

Substitute the point **(4, – 6)** for x and y

LS = 2x + y RS = **2**

= 2(4) + (– 6)

= 8 – 6

= **2**

= RS

EQUATION (2)

LS = y

= **– 6**

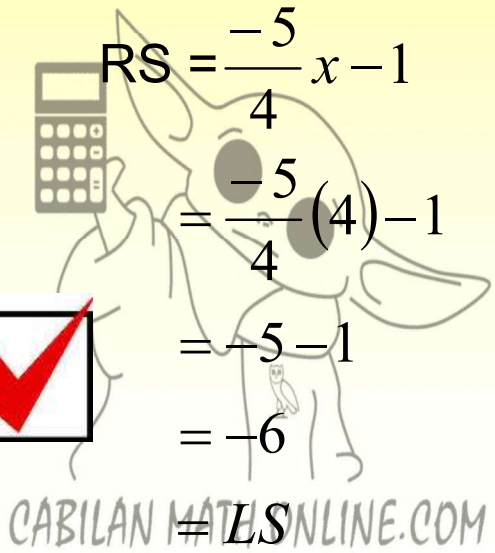
RS = $\frac{-5}{4}x - 1$

$= \frac{-5}{4}(4) - 1$

$= -5 - 1$

$= -6$

$= LS$



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CHAPTER 5.1 SOLVING LINEAR SYSTEMS BY GRAPHING

EXAMPLE 1 *Solve a Linear System by Graphing*

(ii) For the following linear system:

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

(a) Re-arrange the equations into **slope y-intercept form (y = mx + b)**

EQUATION (1)

$x - 2y = 4$

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

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

$y = mx + b$

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

b = **– 2**

EQUATION (2)

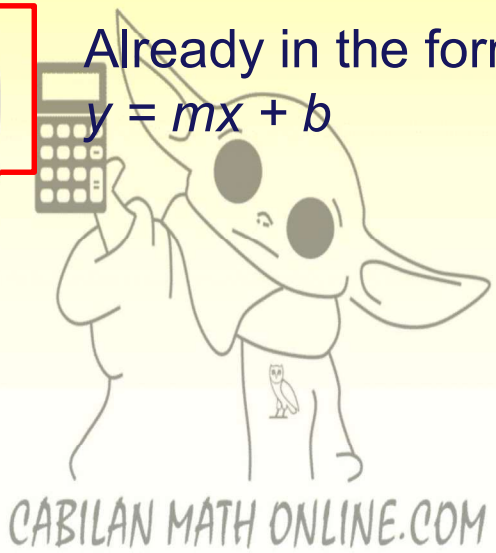
$y = \frac{3}{4}x - 4$

$y = mx + b$

Already in the form $y = mx + b$

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

b = **– 4**



CHAPTER 5.1 SOLVING LINEAR SYSTEMS BY GRAPHING

EXAMPLE 1 *Solve a Linear System by Graphing*

(b) Graph both lines on the same grid. Draw and label the point of intersection.

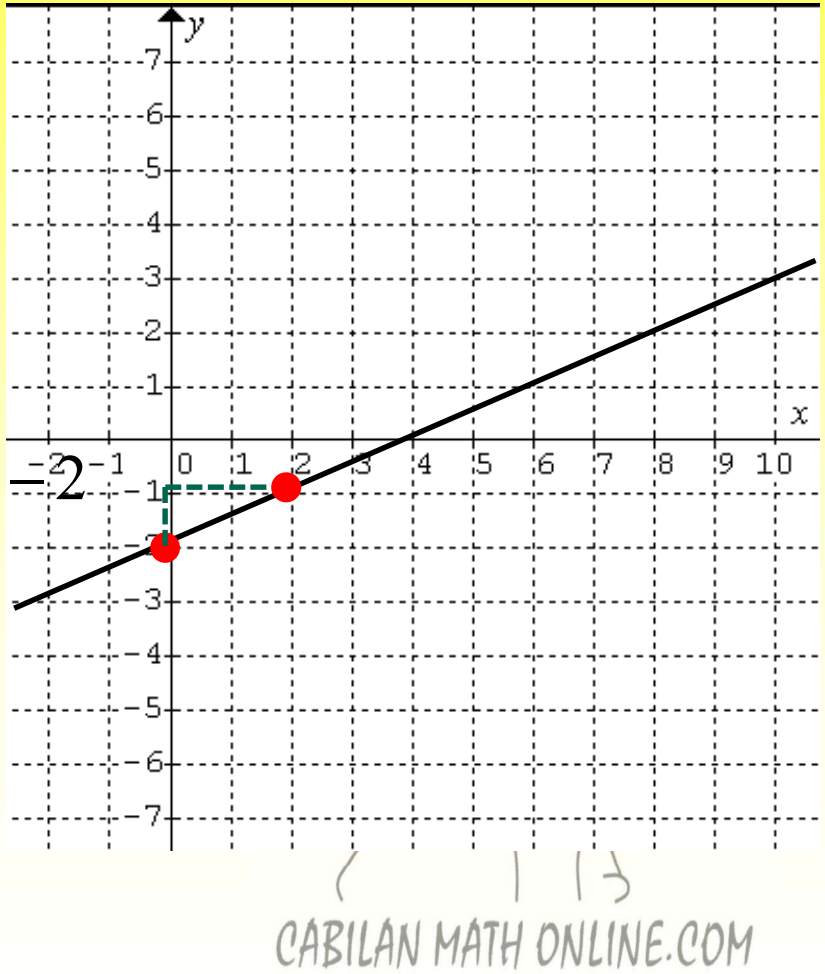
EQUATION (1)

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

m = $\frac{1}{2}$ ← Up 1 / ← Right 2

b = **– 2**

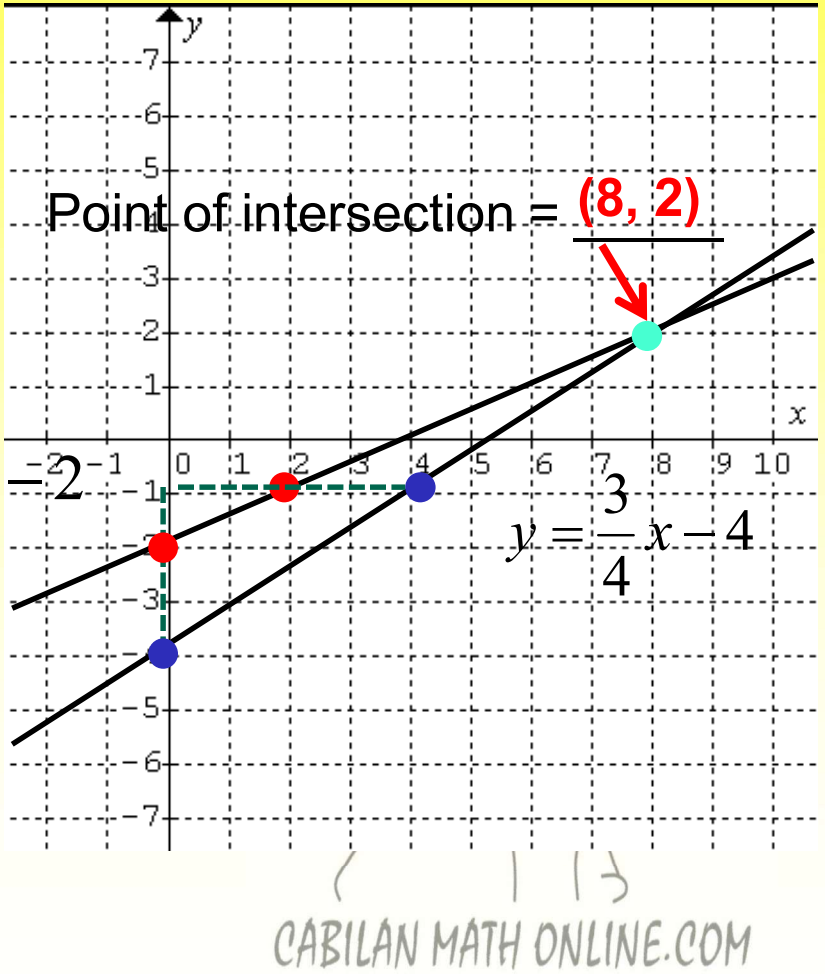
*Plot **y-intercept**
* From y-intercept, use the **slope**
→Perform **rise**
→Perform **run**
→Plot



CHAPTER 5.1 SOLVING LINEAR SYSTEMS BY GRAPHING

EXAMPLE 1 *Solve a Linear System by Graphing*

(b) Graph both lines on the same grid. Draw and label the point of intersection.



EQUATION (2)

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

$m = \frac{3}{4}$ ← Up 3 ← Right 4

b = **– 4**

*Plot **y-intercept**
* From y-intercept, use the **slope**
→Perform **rise**
→Perform **run**
→Plot

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CHAPTER 5.1 SOLVING LINEAR SYSTEMS BY GRAPHING

EXAMPLE 1 *Solve a Linear System by Graphing*

(c) Check your solution into **both** original equations

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

EQUATION (1) ***EQUATION (2)***

x y

Substitute the point **(8, 2)** for x and y

LS = x – 2y RS = **4**

= 8 – 2(2)

= 8 – 4

= **4**

= **RS**

LS = y

= **2**

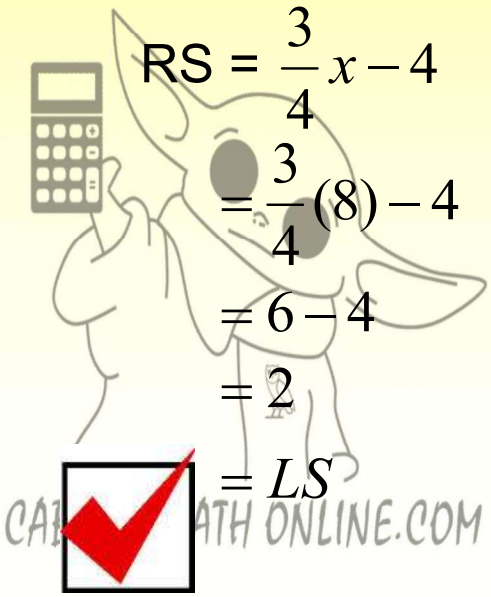
RS = $\frac{3}{4}x - 4$

$= \frac{3}{4}(8) - 4$

$= 6 - 4$

$= 2$

$= LS$



END OF DAY 1

CHAPTER 5.1 SOLVING LINEAR SYSTEMS BY GRAPHING

EXAMPLE 2

Guido's Pizza charges **$9** for a medium pizza plus **$2** for each topping.

Giovanni's Pizza charges **$6** for a medium pizza plus **$3** for each topping.

(a) If *x* represents the **number of toppings** and *y* represents the **total cost**

(i) Write an equation to represent the **total cost** at *Guido's Pizza*

$$y = 2x + 9$$

(ii) Write an equation to represent the **total cost** at *Giovanni's Pizza*

$$y = 3x + 6$$

CHAPTER 5.1 SOLVING LINEAR SYSTEMS BY GRAPHING

EXAMPLE 2

(b) Graph the equations from (i) and (ii) on the same grid

Guido's Pizza	**Giovanni's Pizza**
$y = 2x + 9$	$y = 3x + 6$
$y = mx + b$	$y = mx + b$
$m =$ 2	$m =$ 3
$b =$ 9	$b =$ 6

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CHAPTER 5.1 SOLVING LINEAR SYSTEMS BY GRAPHING

EXAMPLE 2

(b) Graph the equations from (i) and (ii) on the same grid

Guido's Pizza

$y = 2x + 9$

$y = mx + b$

$m = \underline{2}$

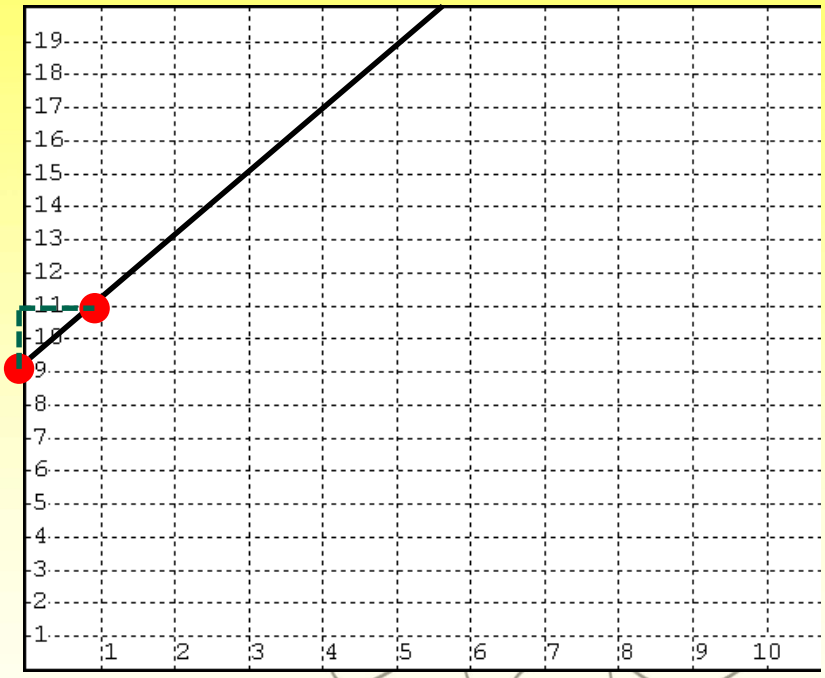
$b = \underline{9}$

Express as a fraction

$\frac{2}{1}$ ← Up 2

← Right 1

*Plot **y-intercept**
* From y-intercept, use the **slope**
→Perform **rise**
→Perform **run**
→Plot



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CHAPTER 5.1 SOLVING LINEAR SYSTEMS BY GRAPHING

EXAMPLE 2

(b) Graph the equations from (i) and (ii) on the same grid

Giovanni's Pizza

$y = 3x + 6$

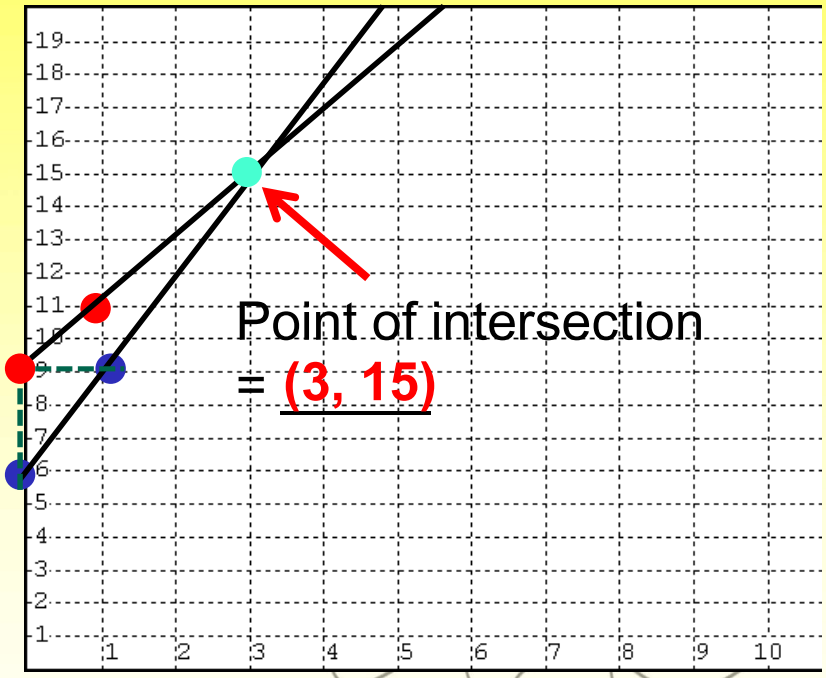
$y = mx + b$

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

$b = 6$

Express as a fraction

$\frac{3}{1}$ ← Up 3 ← Right 1



*Plot **y-intercept**
* From y-intercept, use the **slope**
→Perform **rise**
→Perform **run**
→Plot

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CHAPTER 5.1 SOLVING LINEAR SYSTEMS BY GRAPHING

EXAMPLE 2

(c) What is the point of intersection?

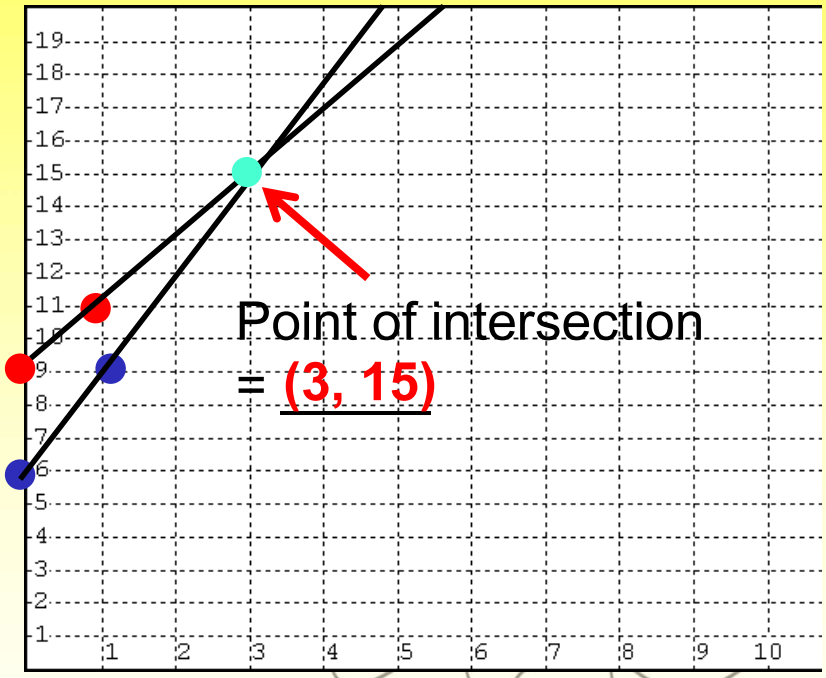
(3, 15)

$15

3 toppings

What does this represent in this situation?

Both pizza places will charge the same price (**$15**) for a **3 topping** pizza



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CHAPTER 5.1 SOLVING LINEAR SYSTEMS BY GRAPHING

Homework:

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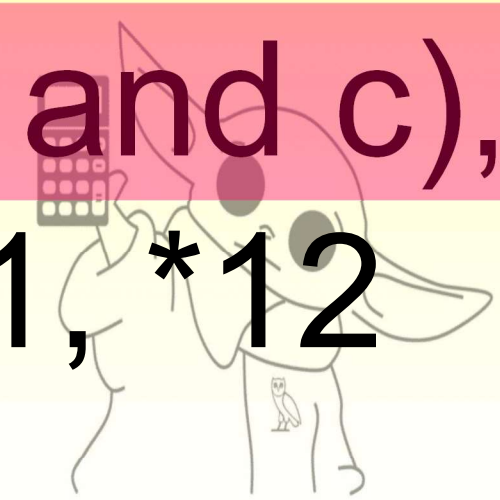
(Day 1) #1 – 4 (a and c),

(Day 2) 5, 8, *11, *12