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## Solving Systems by Graphing

Unit 6 Lesson 1

# SOLVING SYSTEMS BY GRAPHING

## Students will be able to:

Recognize the different types of linear systems of equations and find its solution by graphing.

## Key Vocabulary:

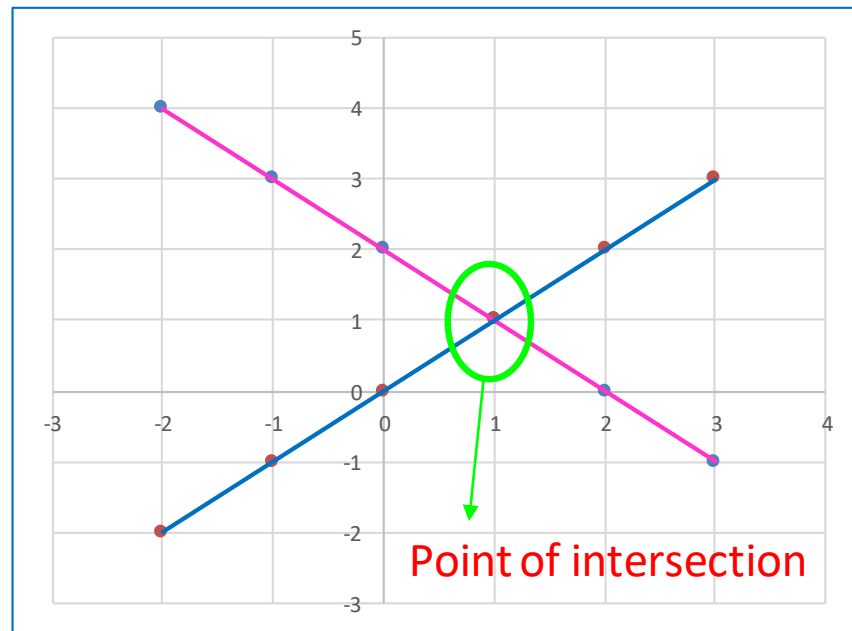
- Solve Linear Systems by Graphing
- Linear Equations in two variables
- Point of Intersection between Linear Functions
- Independent System
- Dependent System
- Inconsistent System



# SOLVING SYSTEMS BY GRAPHING

## LINEAR SYSTEM OF EQUATIONS

is a set of equations with the same variables. When we are solving systems graphically, we have to find the intersection between the two lines.



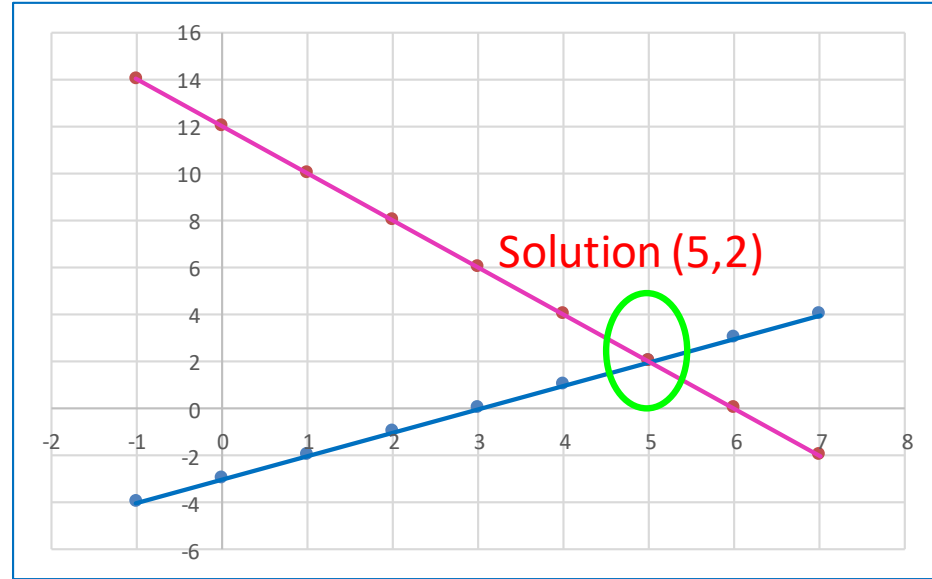
## CLASSIFICATION OF LINEAR SYSTEMS

1. Independent System (One solution).
2. Dependent System (Infinite solutions).
3. Inconsistent System (No solution).



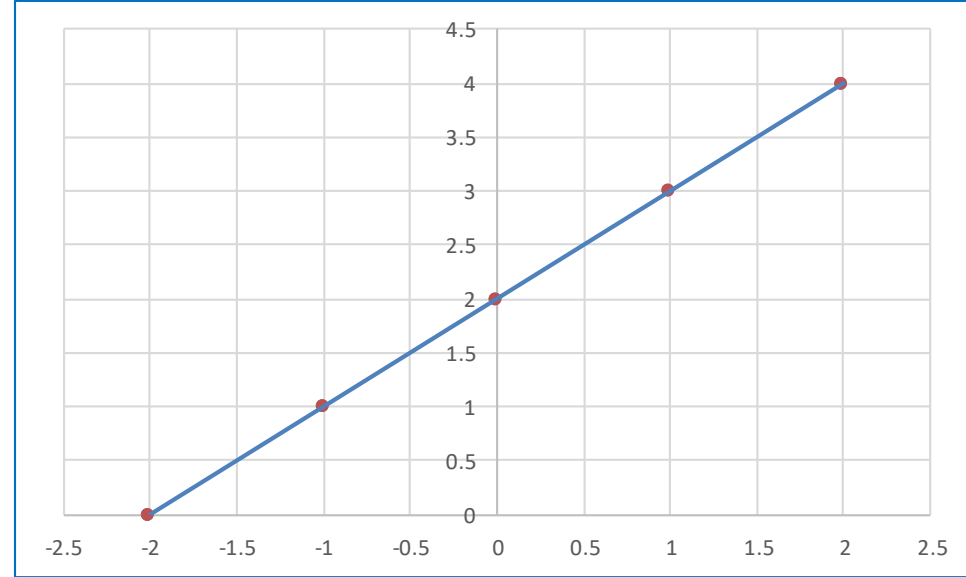
# SOLVING SYSTEMS BY GRAPHING

**INDEPENDENT SYSTEM** is a system where two distinct non-parallel lines intersect at one specific point  $(x,y)$ .



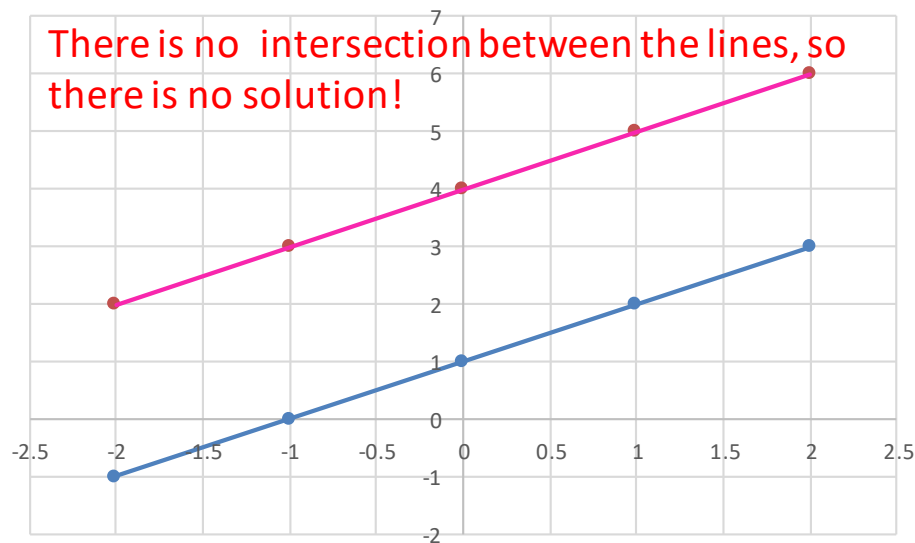
# SOLVING SYSTEMS BY GRAPHING

**DEPENDENT SYSTEM** is a system where appears to show only one line. Actually, there are two lines, one upon the other, then it has infinite solutions.



# SOLVING SYSTEMS BY GRAPHING

**INCONSISTENT SYSTEM** is a system where two distinct lines are parallel. Since parallel lines never intersect, then there can be no solution.



## SOLVING SYSTEMS BY GRAPHING

**LINEAR FUNCTION** to graph a linear function it is necessary to find its point of intersection with the axes.

X axis, where  $y=0$

Y axis, where  $x=0$

**EQUATION OF A LINEAR FUNCTION** it is represented by the following equation:

$$y - y_1 = m(x - x_1)$$

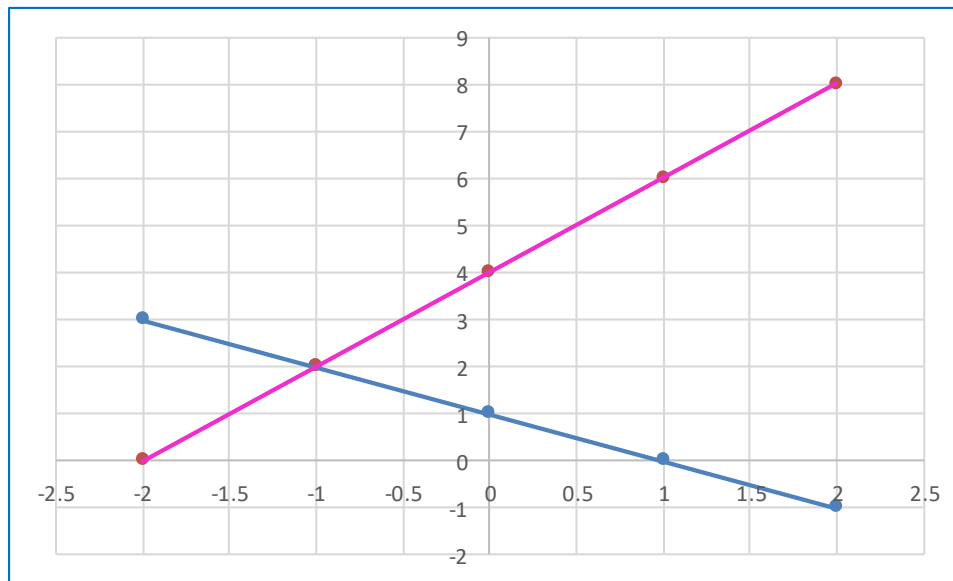
Where  $m$  is the slope of the line and  $(x_1, y_1)$  is a point that belongs to the linear function. The slope can be calculated by selecting two points from the graph and substituting them in the following equation:

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



# SOLVING SYSTEMS BY GRAPHING

**Sample Problem 1:** From the given graph, identify the equations of the linear function that compose the system



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**Sample Problem 1:** From the given graph, identify the equations of the linear function that compose the system

Select two points for each linear function to calculate its equation, one point would be the intersection point and the other a point that belong to each of the corresponding linear function.

- For the blue line:  $(-1,2)$  and  $(0,1)$

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1} (x - x_1)$$

$$y - 1 = \frac{2 - 1}{-1 - 0} (x - 0)$$

$$y = -x + 1 \rightarrow x + y = 1$$

## SOLVING SYSTEMS BY GRAPHING

**Sample Problem 1:** From the given graph, identify the equations of the linear function that compose the system

- For the pink line:  $(-1, 2)$  and  $(0, 4)$

$$y - 4 = \frac{2 - 4}{-1 - 0}(x - 0)$$

$$y = 2(x - 0) + 4$$

$$y = 2x + 4 \rightarrow -2x + y = 4$$

## SOLVING SYSTEMS BY GRAPHING

**Sample Problem 1:** From the given graph, identify the equations of the linear function that compose the system

- For the pink line:  $(-1, 2)$  and  $(0, 4)$

$$y - 4 = \frac{2 - 4}{-1 - 0}(x - 0)$$

$$y = 2(x - 0) + 4$$

$$y = 2x + 4 \rightarrow -2x + y = 4$$

Finally:

$$\begin{cases} x + y = 1 \\ -2x + y = 4 \end{cases}$$

## SOLVING SYSTEMS BY GRAPHING

**Sample Problem 2:** Find the solution of the following system by graphing:

$$\begin{cases} 3X - Y = 3 \\ X + Y = -3 \end{cases}$$

## SOLVING SYSTEMS BY GRAPHING

**Sample Problem 2:** Find the solution of the following system by graphing:

One easy way to graph each linear function is to find its intercepts with the axes.

- $3x - y = 3$

$$x = 0 \rightarrow y = -3 \rightarrow (0, -3)$$

$$y = 0 \rightarrow x = 1 \rightarrow (1, 0)$$

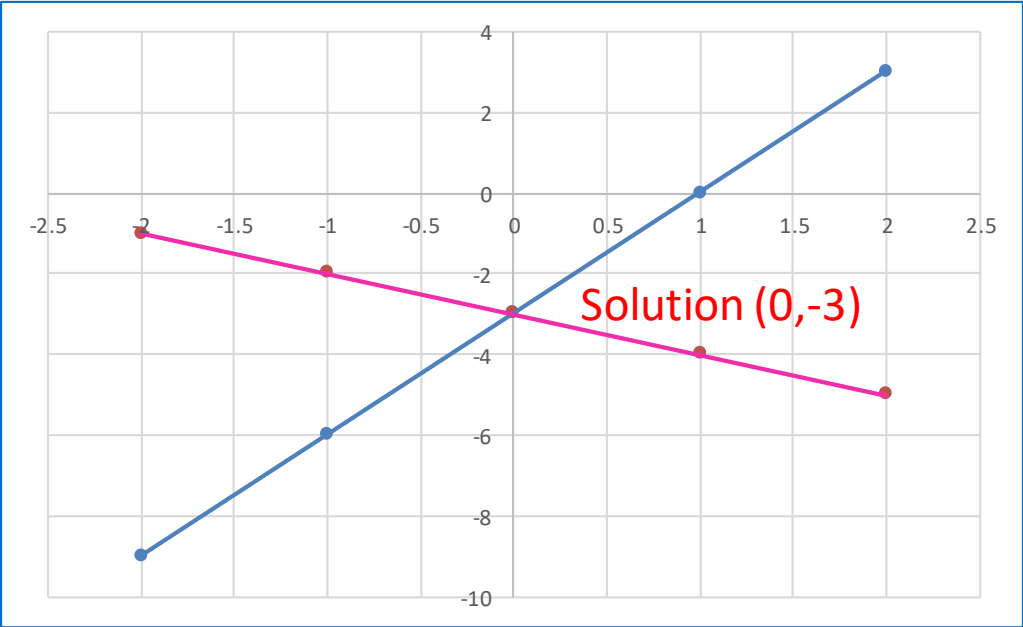
- $x + y = -3$

$$x = 0 \rightarrow y = -3 \rightarrow (0, -3)$$

$$y = 0 \rightarrow x = -3 \rightarrow (-3, 0)$$

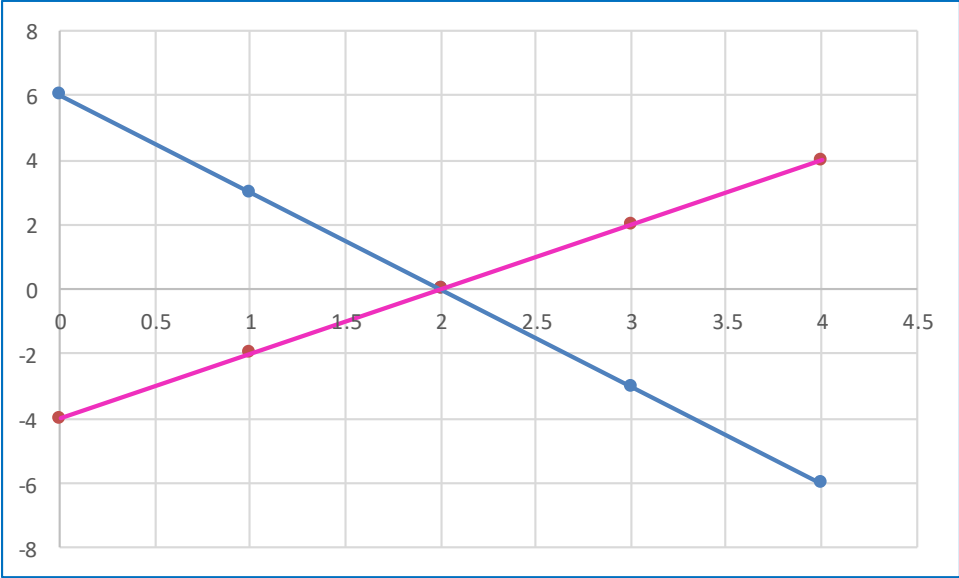
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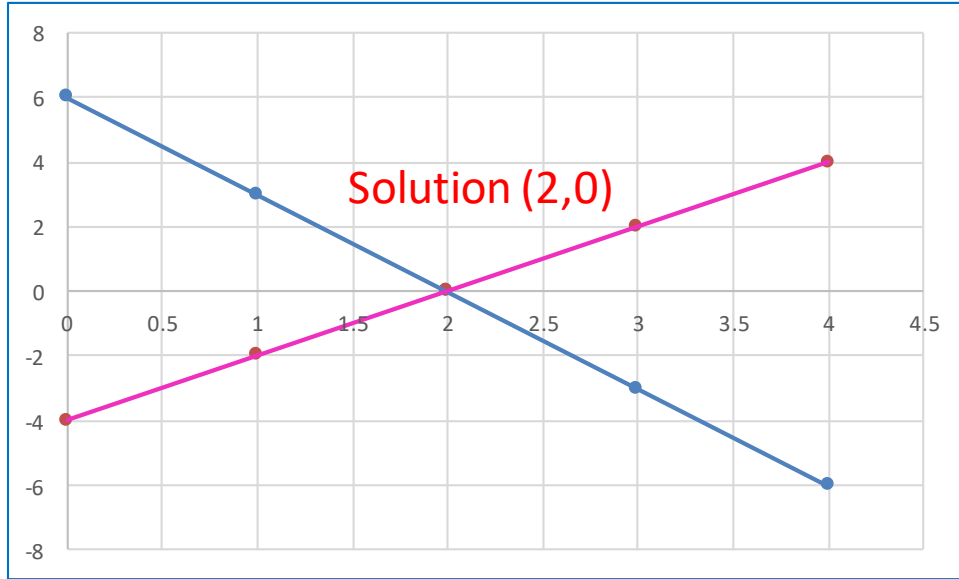
**Sample Problem 3:** Identify the solution of the system and determine what type of system is





## SOLVING SYSTEMS BY GRAPHING

**Sample Problem 3:** Identify the solution of the system and determine what type of system is



The solution of the system is given by the point of intersection between the lines, in this case is the point (2,0) and it represents an independent system.