Chapter 3

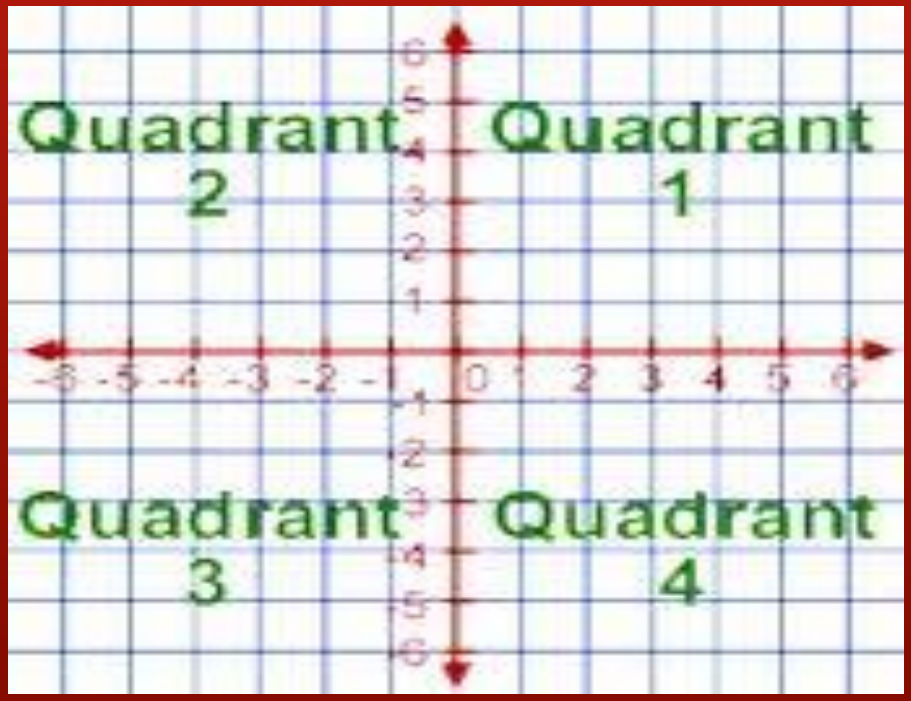
Graphing Linear Equations and Functions

3.1

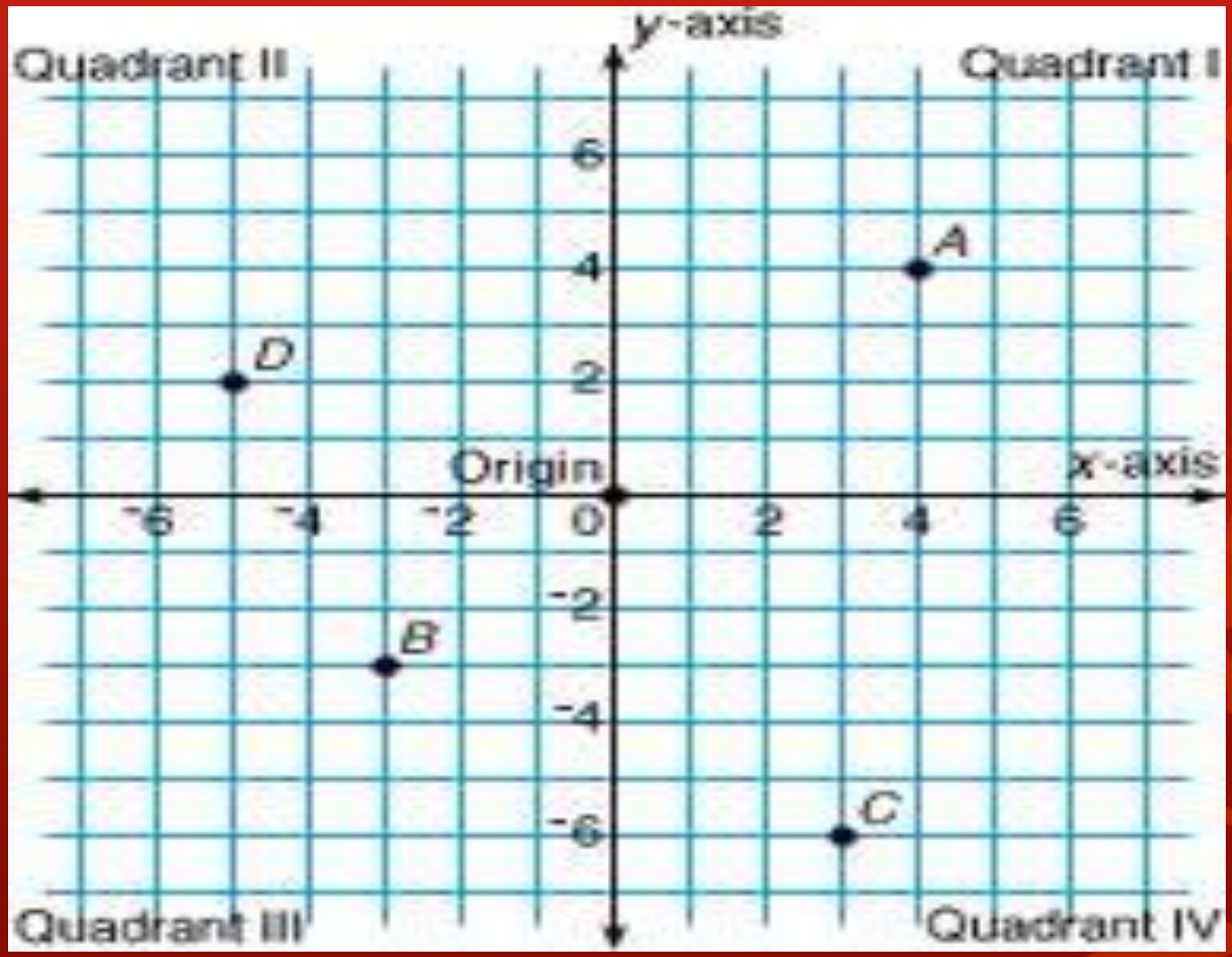
Plot Points in a Coordinate Plane

Coordinate Plane-

- Two _____ intersecting at a _____angle.
- **x-axis** – the _____ axis
- **y-axis** – the _____ axis
- The coordinate plane is divided into _____.

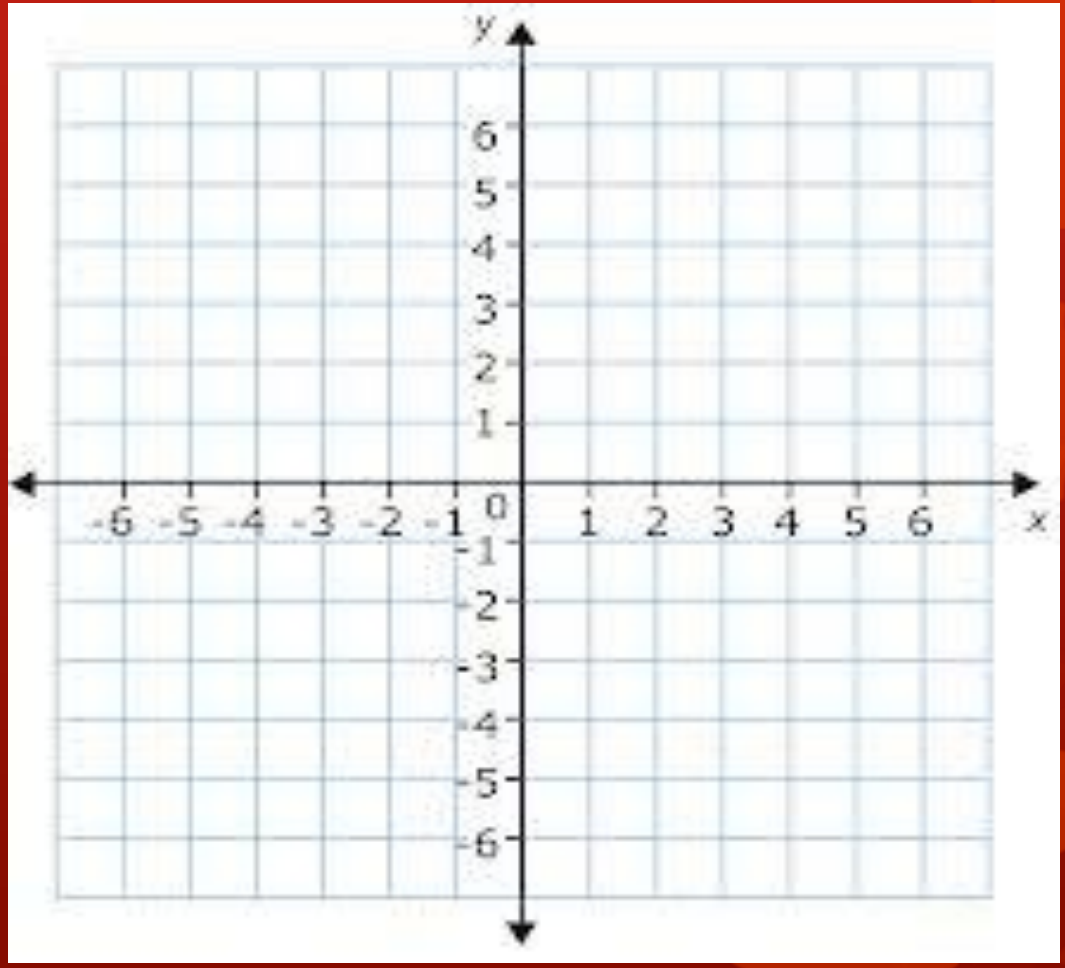


EX: Give the coordinates of the point.



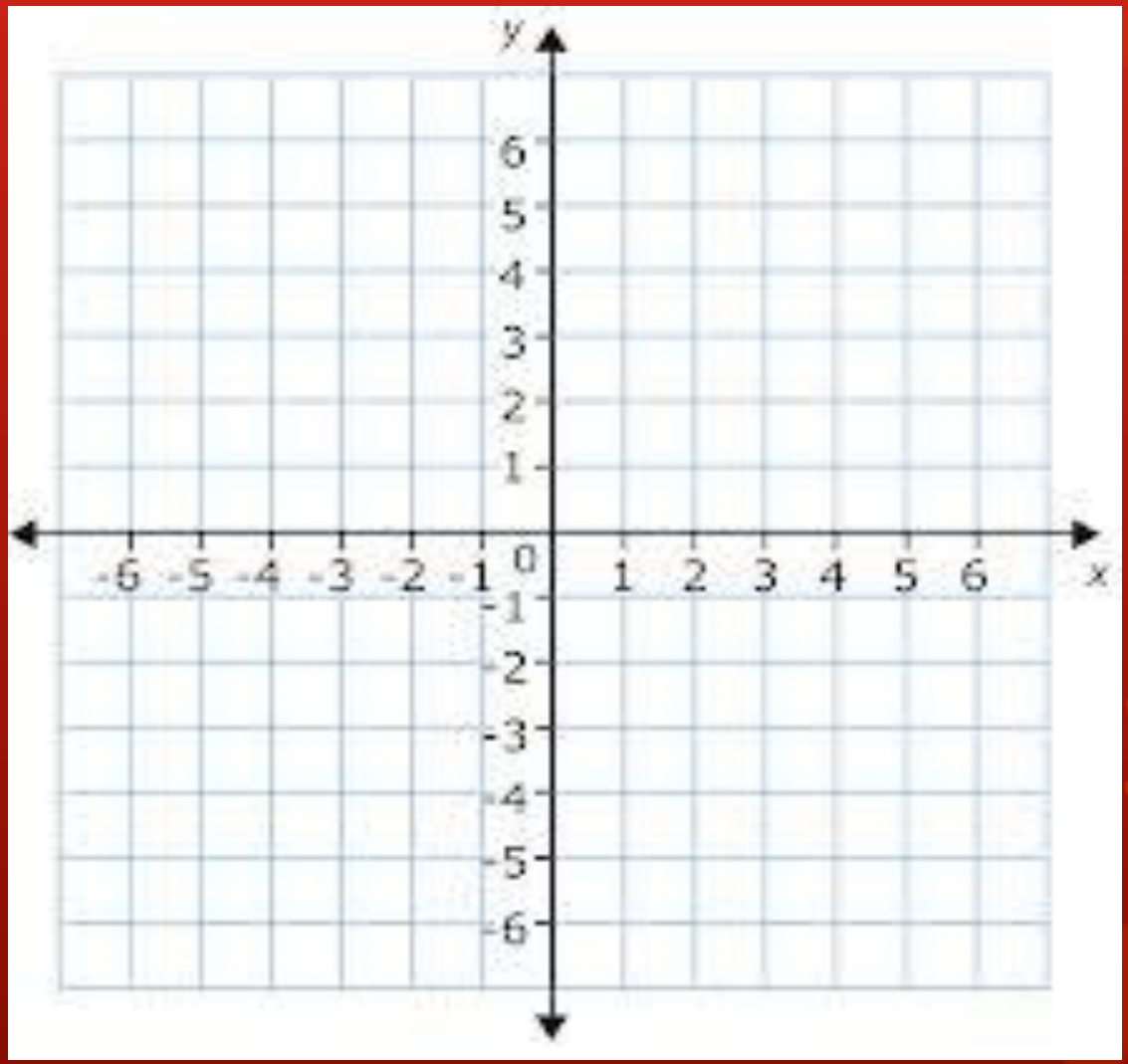
EX: Plot the point in a coordinate plane **and** describe the location of the point.

- A(2,5)
- B(-1,0)
- C(-2,-1)
- D(-5,3)
- E(0,0)
- F(0,4)



EX:

- Graph the function $y = \frac{-1}{3}x + 2$ with domain -6, -3, and 0. Then identify the range on the function.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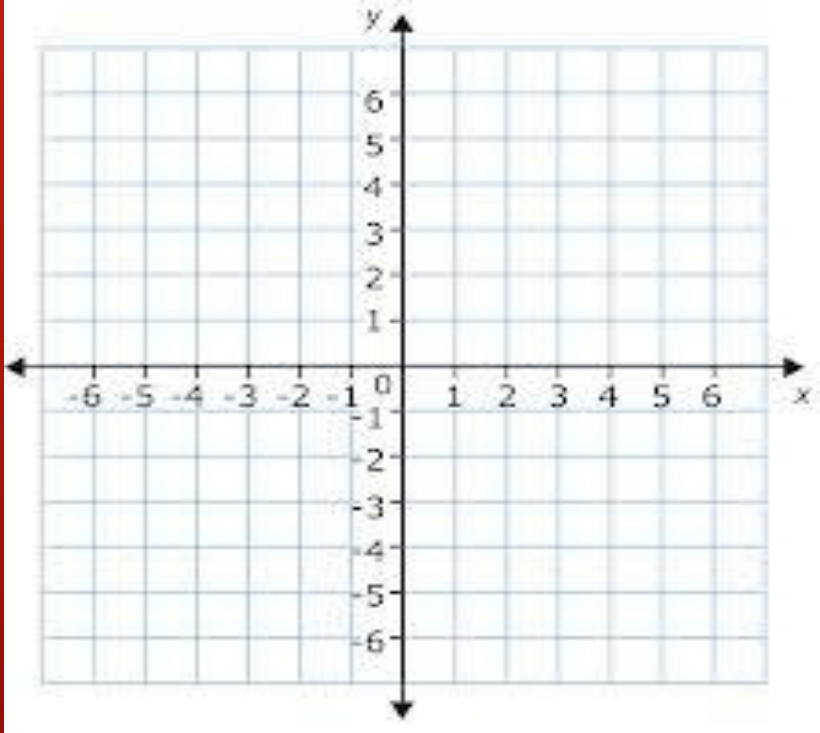
EX:

- The table shows attendance at a school carnival before and after the school added game booths in 2002.
- A) Explain how you know that the table represents a function.
- B) Graph the function.
- C) Describe any trends.

Years, x, before or since 2002	**-2**	**-1**	**0**	**1**
Attendance, y (hundreds)	2.6	2.2	3.1	3.5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3.2 Graph Linear Equations

Linear Equations

- **Linear equations** – an equation whose _____ _____.
- **Standard Form of a Linear Equation**: _____
  - A, B, and C are _____

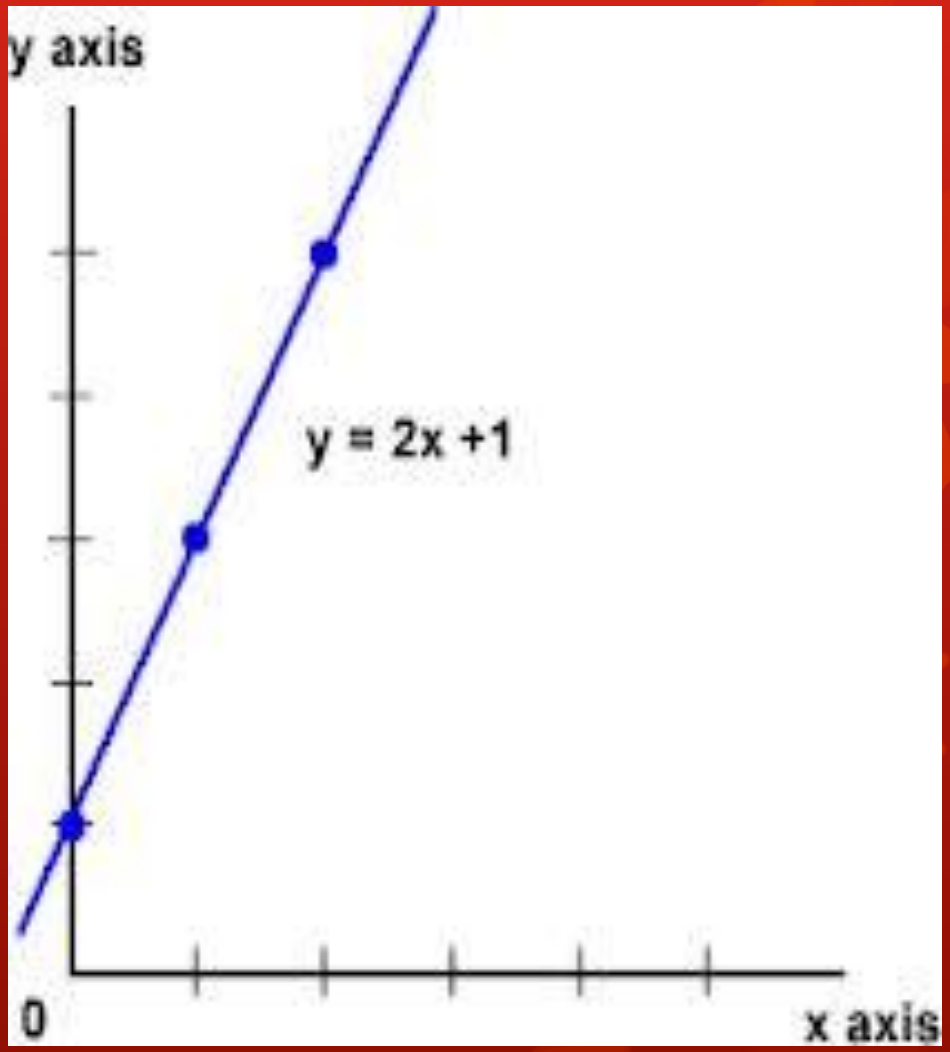
Equations in 2 Variables

- **Solution of an Equation in 2 Variables** – the _____, that produces a _____ when the values of x and y are _____into the equation.
- EX: Tell whether $(4, \frac{-1}{2})$ is a solution of $x + 2y = 5$

- EX: Tell whether (1, -4) is a solution of $3x - y = 7$

Graphs

- **The Graph of an Equation in 2 Variables** – the _____ in a coordinate plane that represent _____ _____ of the equation.

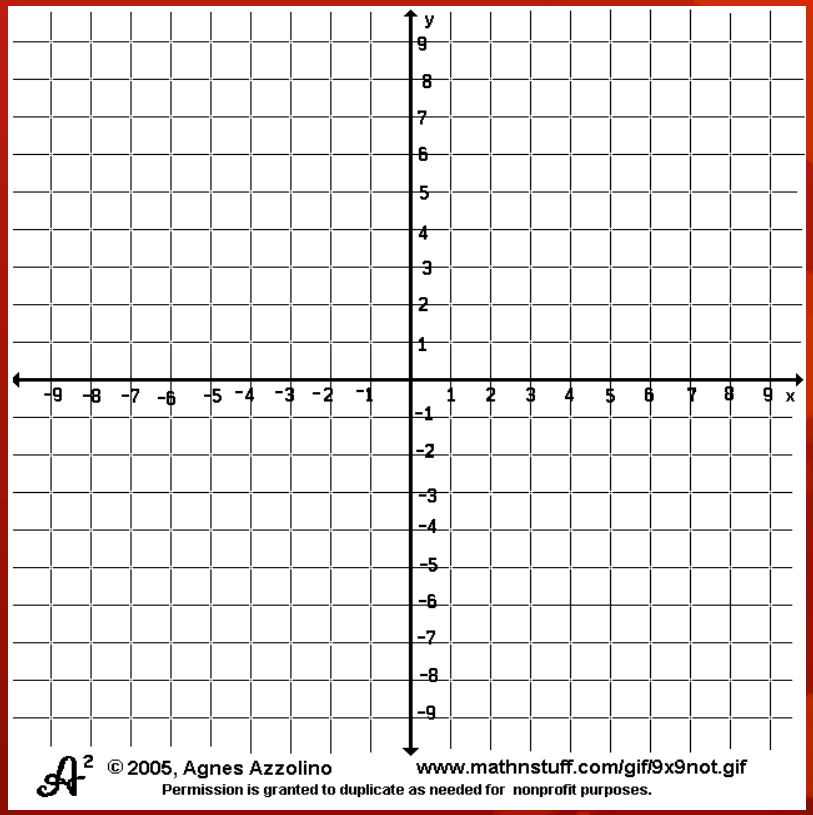


Method 1: Graphing By _____ _____:

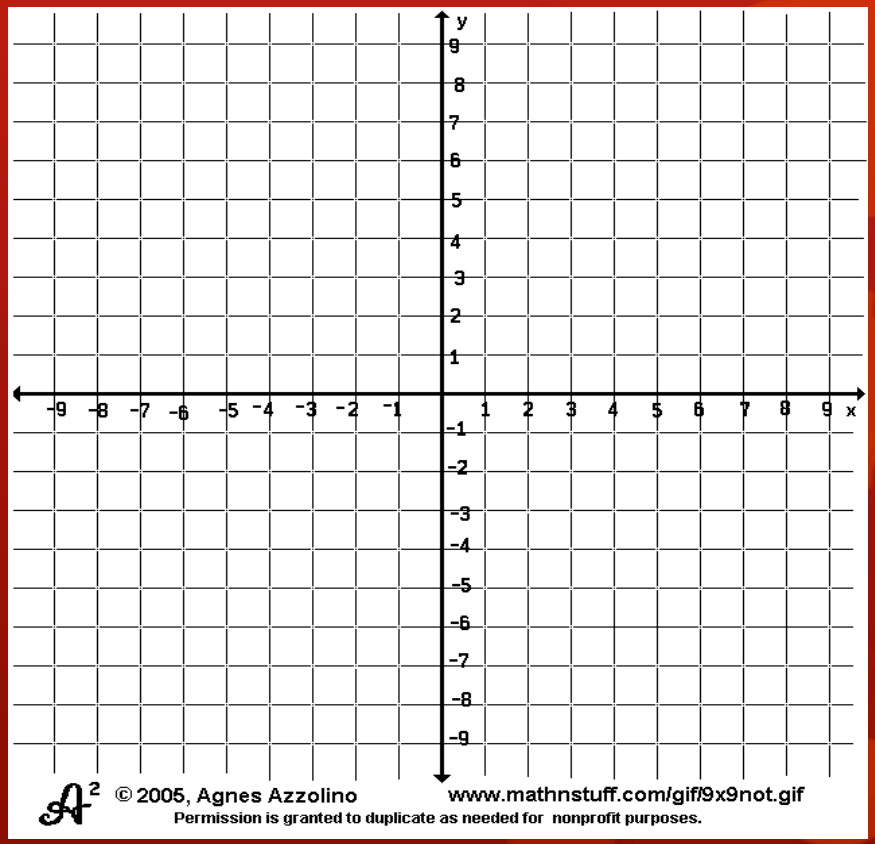
- Make a _____.
  - Choose _____ convenient values for _____ .
  - Find _____.
- Plot the _____.
- Connect the points with a _____ _____.

EX: Graph the equation by making a table.

- NOTE: It will be helpful to rewrite the equation so that y is a function of x.
- -2x + y = -3



- $2y - 6x = 10$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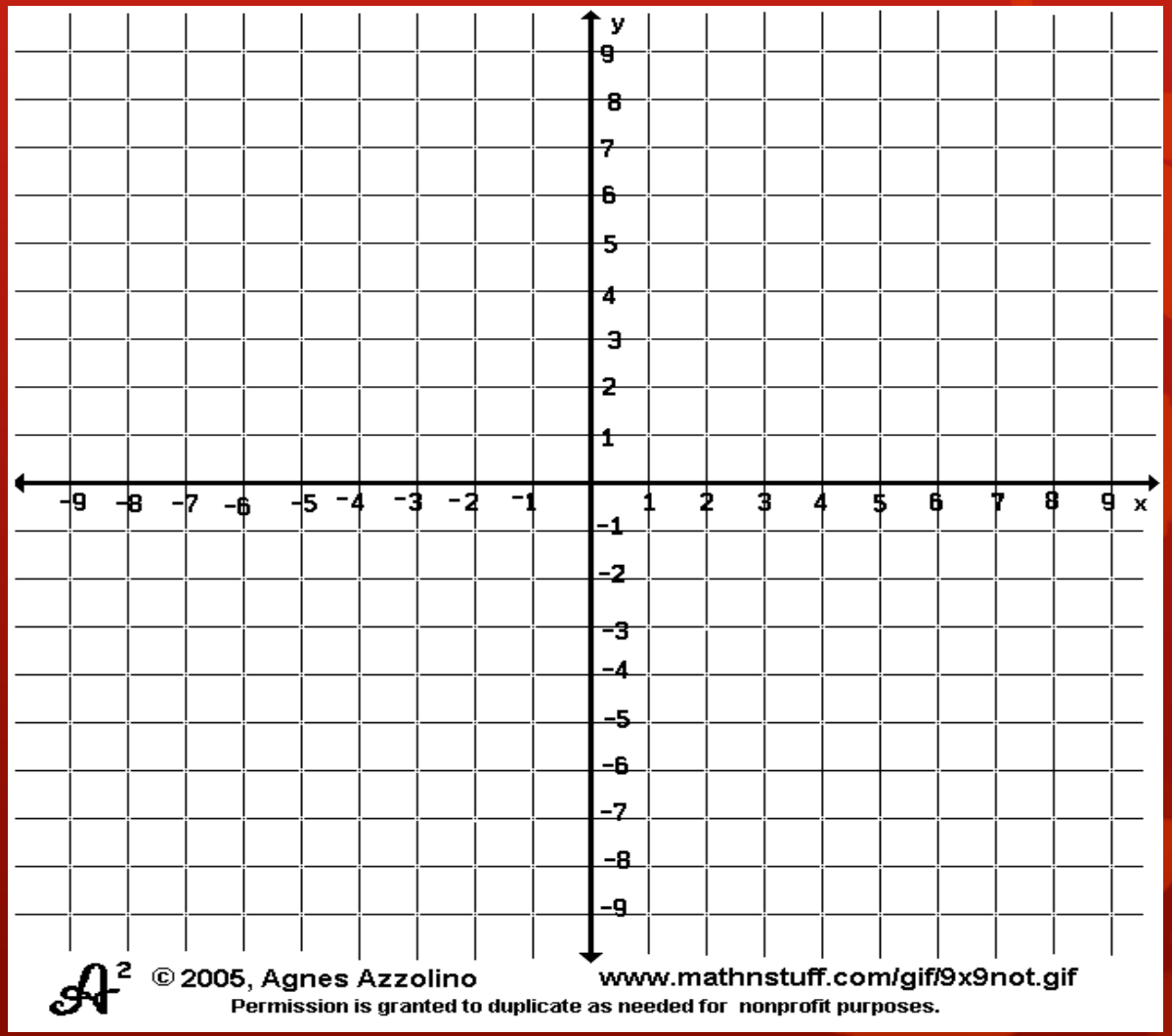
Equations of Horizontal and Vertical Lines:

- The graph of _____ is a _____line.
- The graph of _____ is a _____ line.

Graph.

- y = 2.5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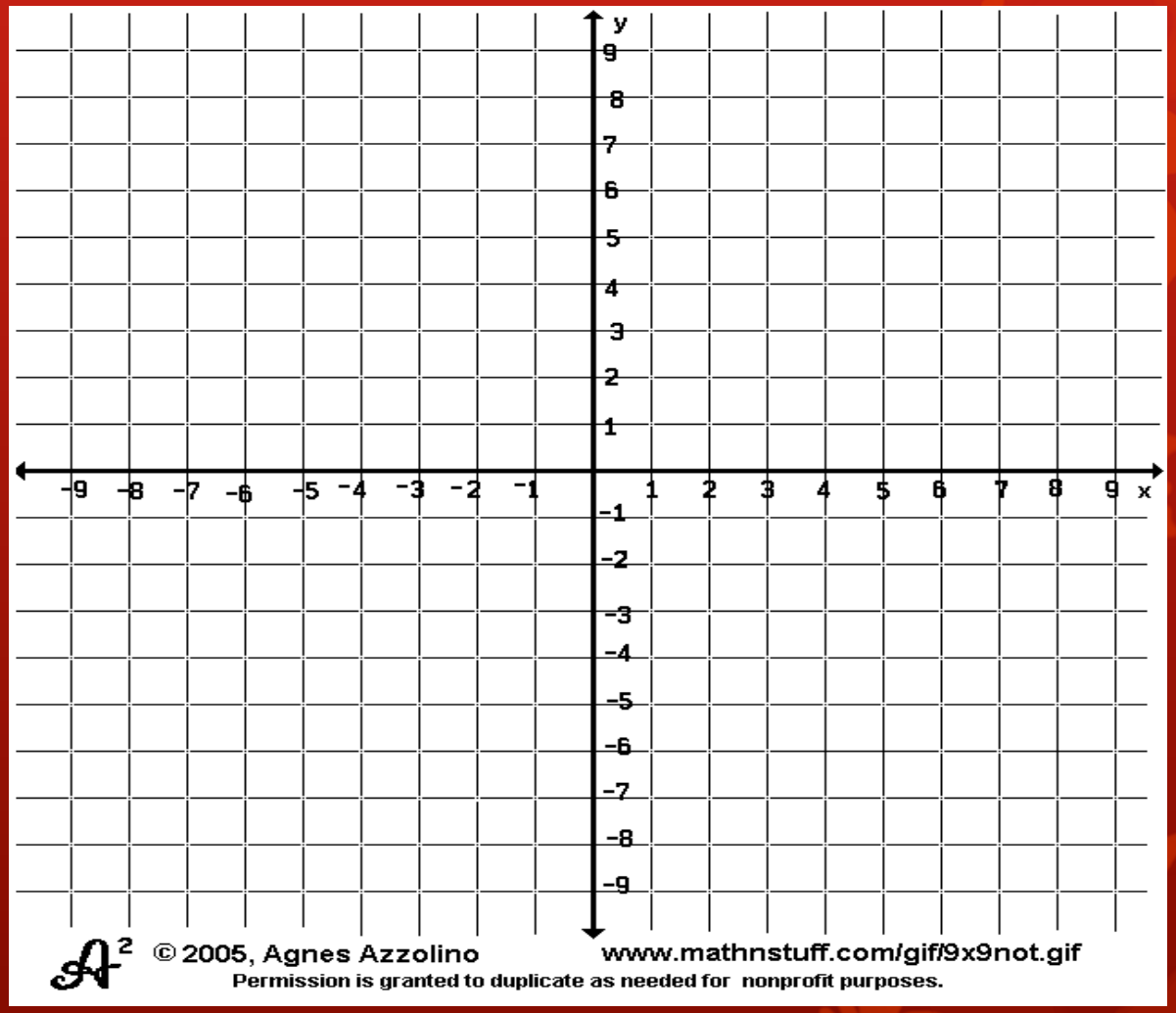
Graph.

- x = -4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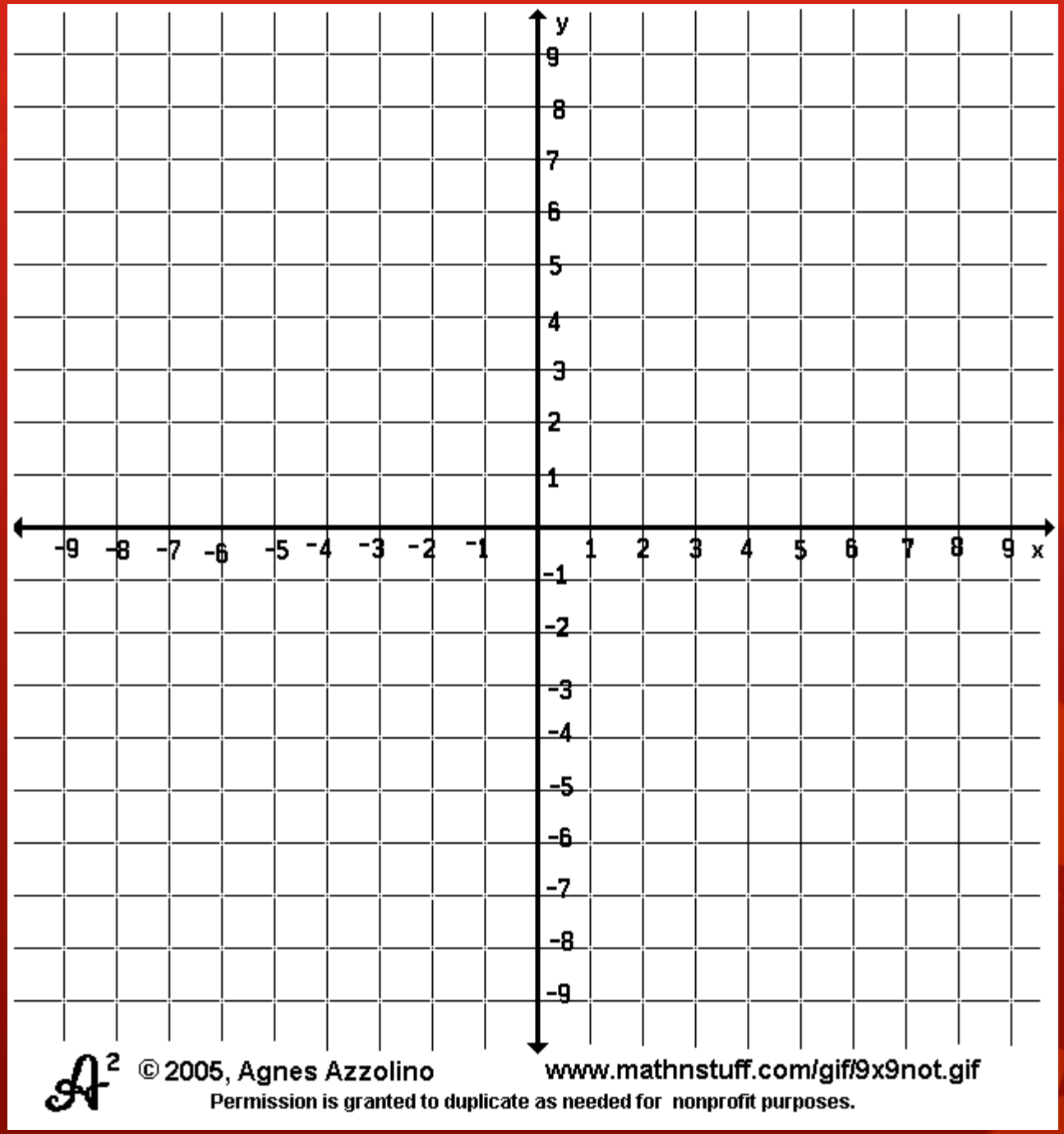
Restricting the Domain

- Sometimes the domain of a linear function is restricted.
- Meaning: _____
- EX: y = 3x + 5 with domain $x \geq 0$
- EX: y = x – 9 with domain $-2 \leq x \leq 3$
- As a result, your range will also be restricted also.

EX: Graph the function with the given domain. Then identify the range of the function.

- $y = -3x + 1$ with domain $x \leq 0$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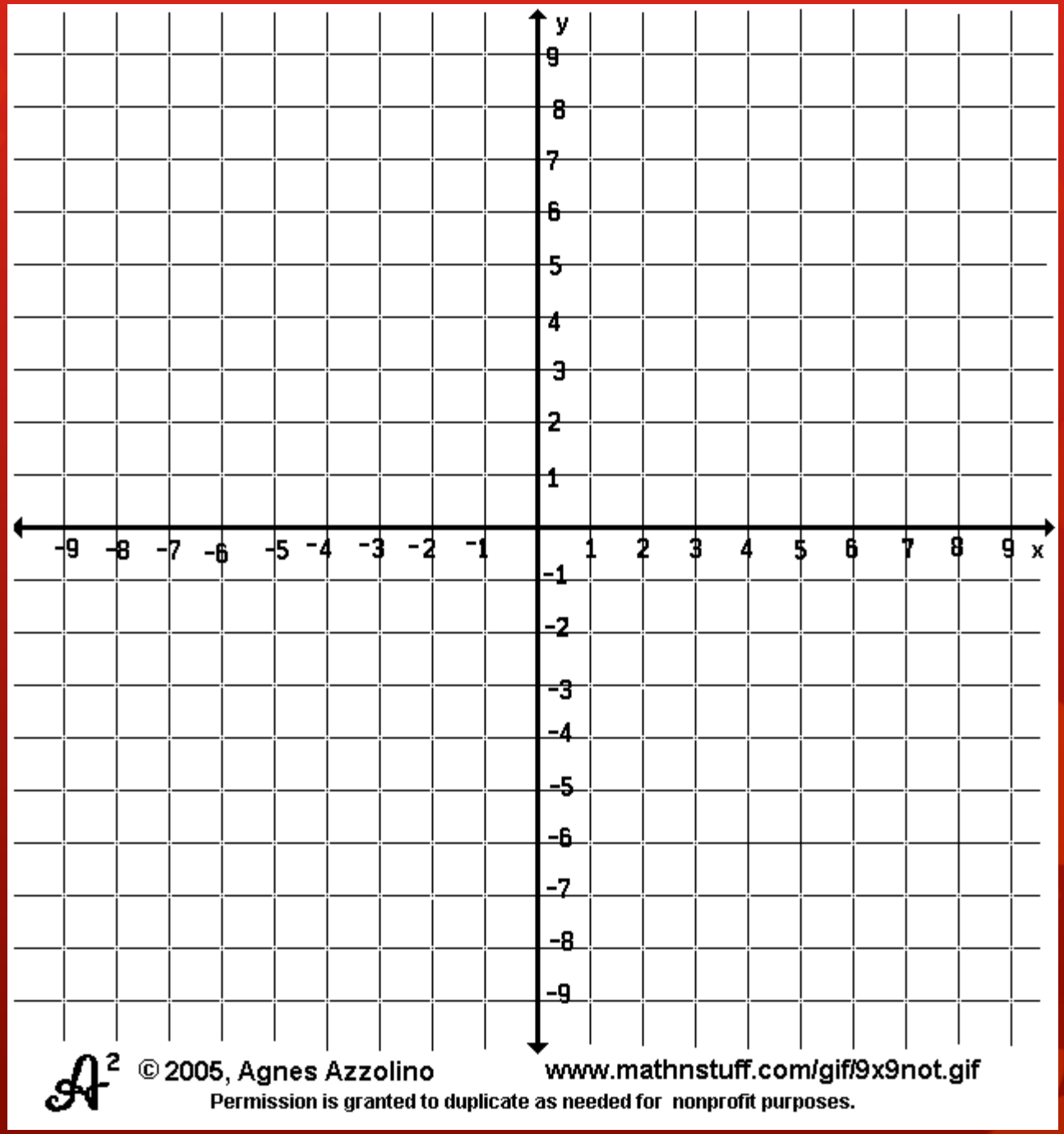
- $y = -x - 1$ with domain $-1 \leq x \leq 3$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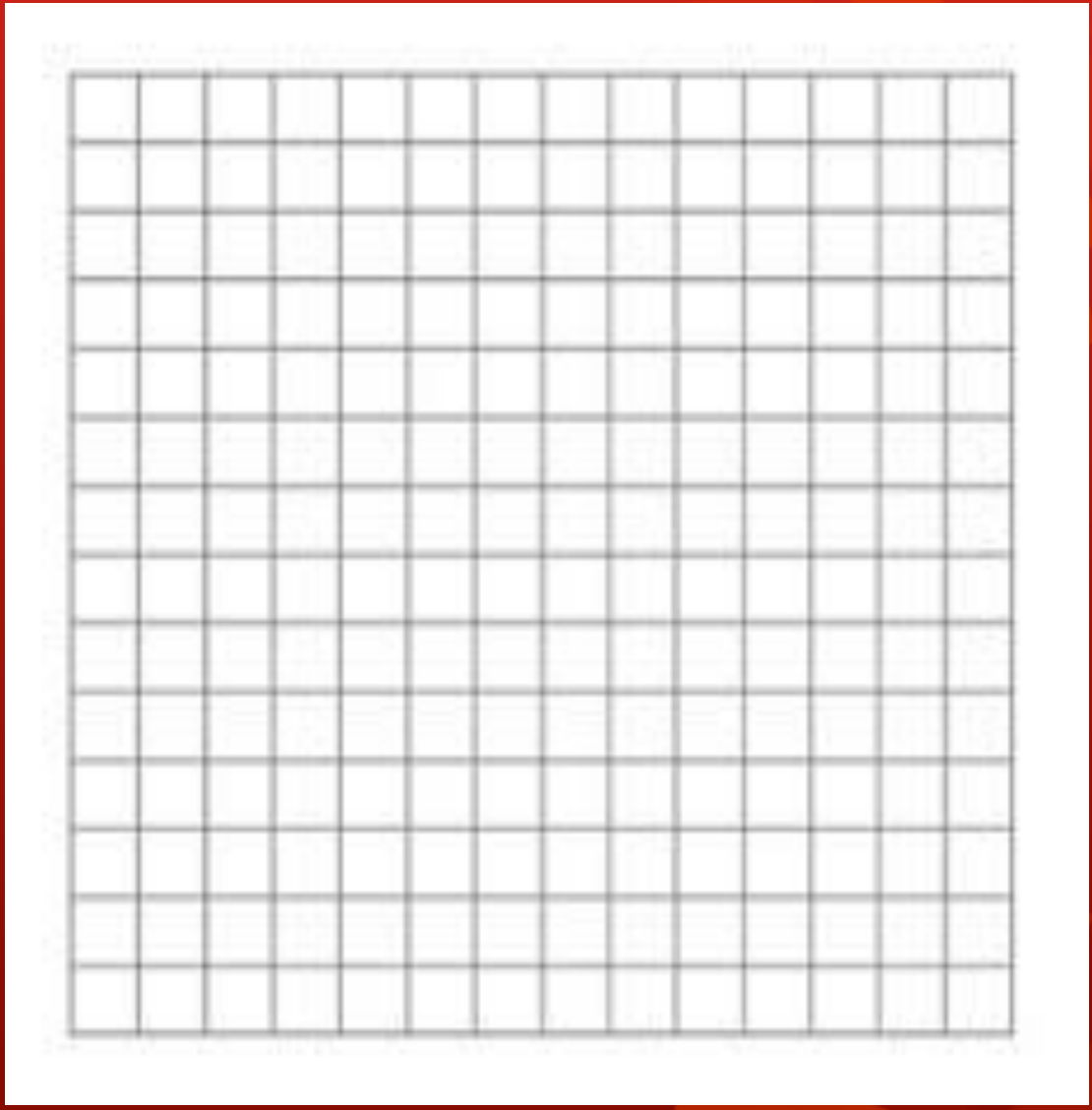
EX:

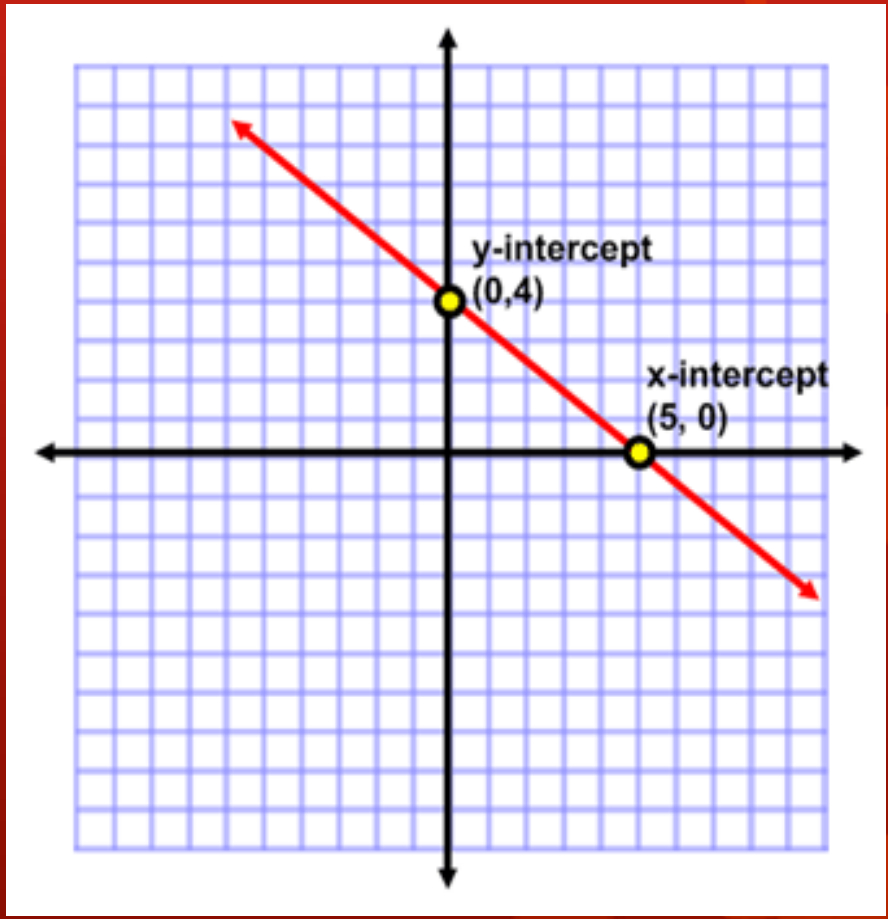
- The distance **d** (in miles)that a runner travels is given by the function **d = 6t** where **t** is the time (in hours) spent running. The runner plans to go for a 1.5 hour run. Graph the function and identify its domain and range.



3.3 Graph Using Intercepts

Intercepts on a Graph

- **X-intercept**: where the graph _____ _____
  - To find the x-intercept of an equation, _____ _____and solve for x.
- **Y-intercept**: where the graph _____ _____
  - To find the y-intercept of an equation, _____ _____ and solve for y.



EX: Find the x-intercept and the y-intercept of the graph of the equation.

- $-3x + 5y = -15$

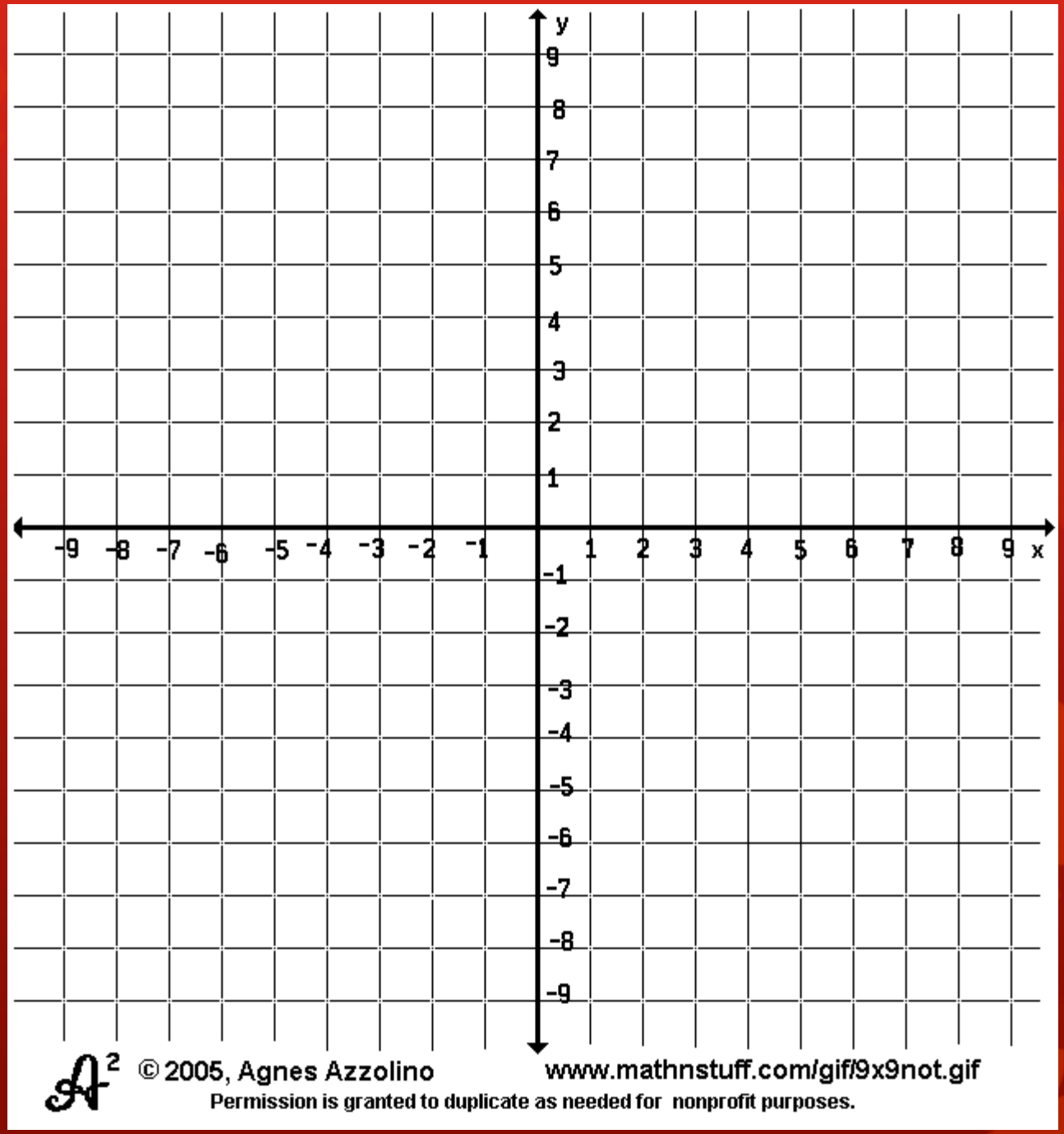
- $4x - 2y = 10$

Graphing Method 2: x and y Intercepts

- Find the _____.
- Find the _____.
- Plot and _____the two points and connect them with a _____.

EX: Graph each equation. Label the points where the line crosses the axes.

- $6x + 7y = 42$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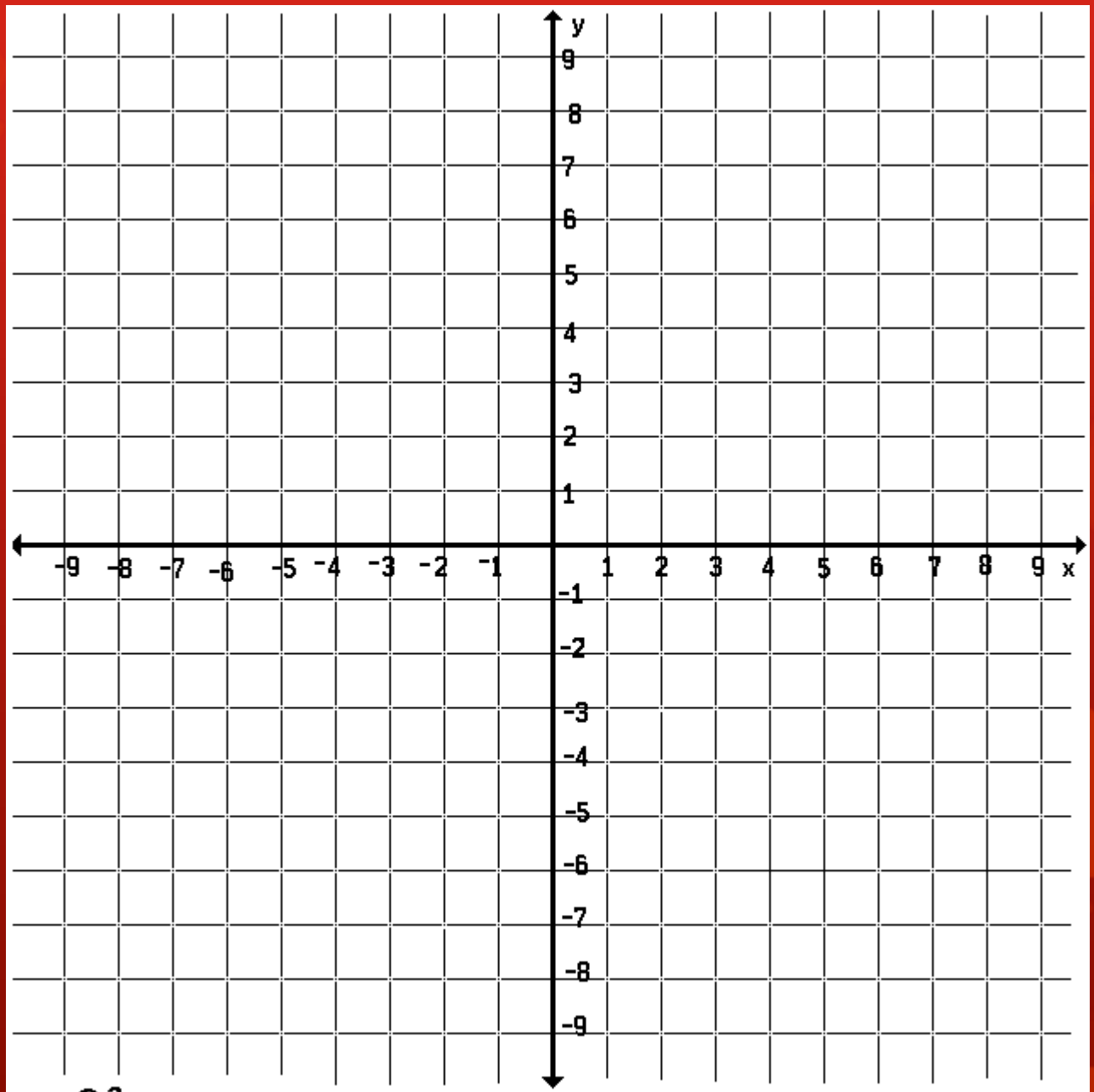
- $y = -4x + 3$



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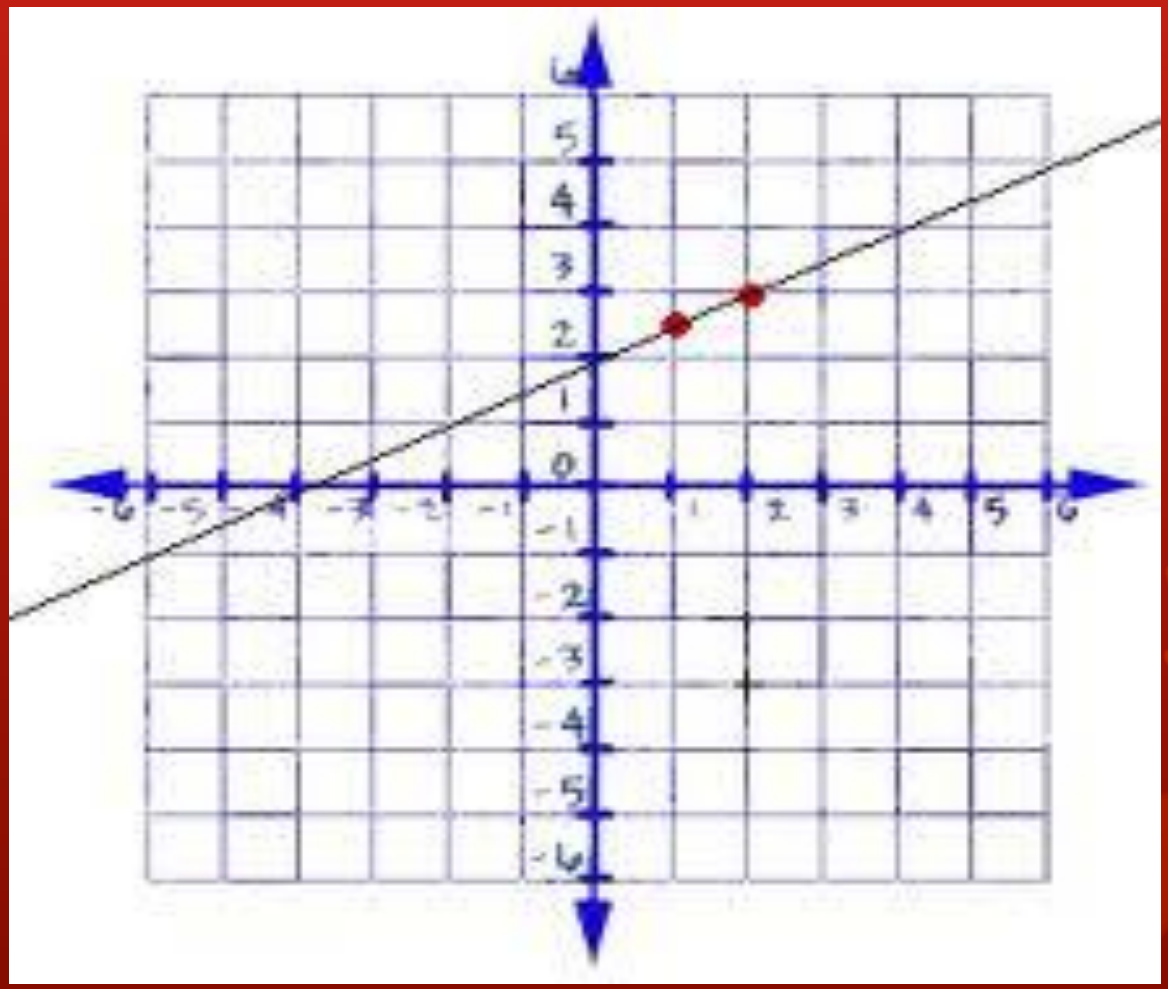
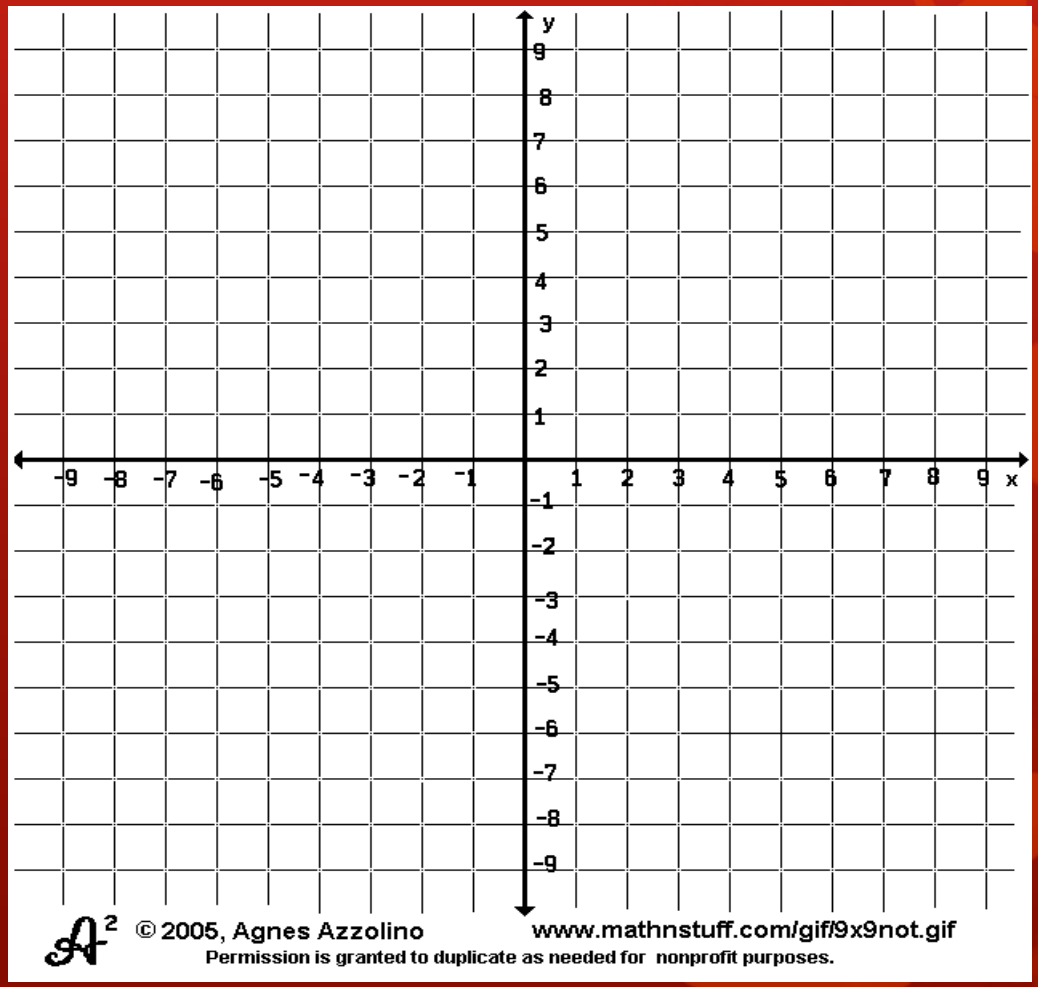
EX: Identify the x-intercept and the y-intercept of the graph.



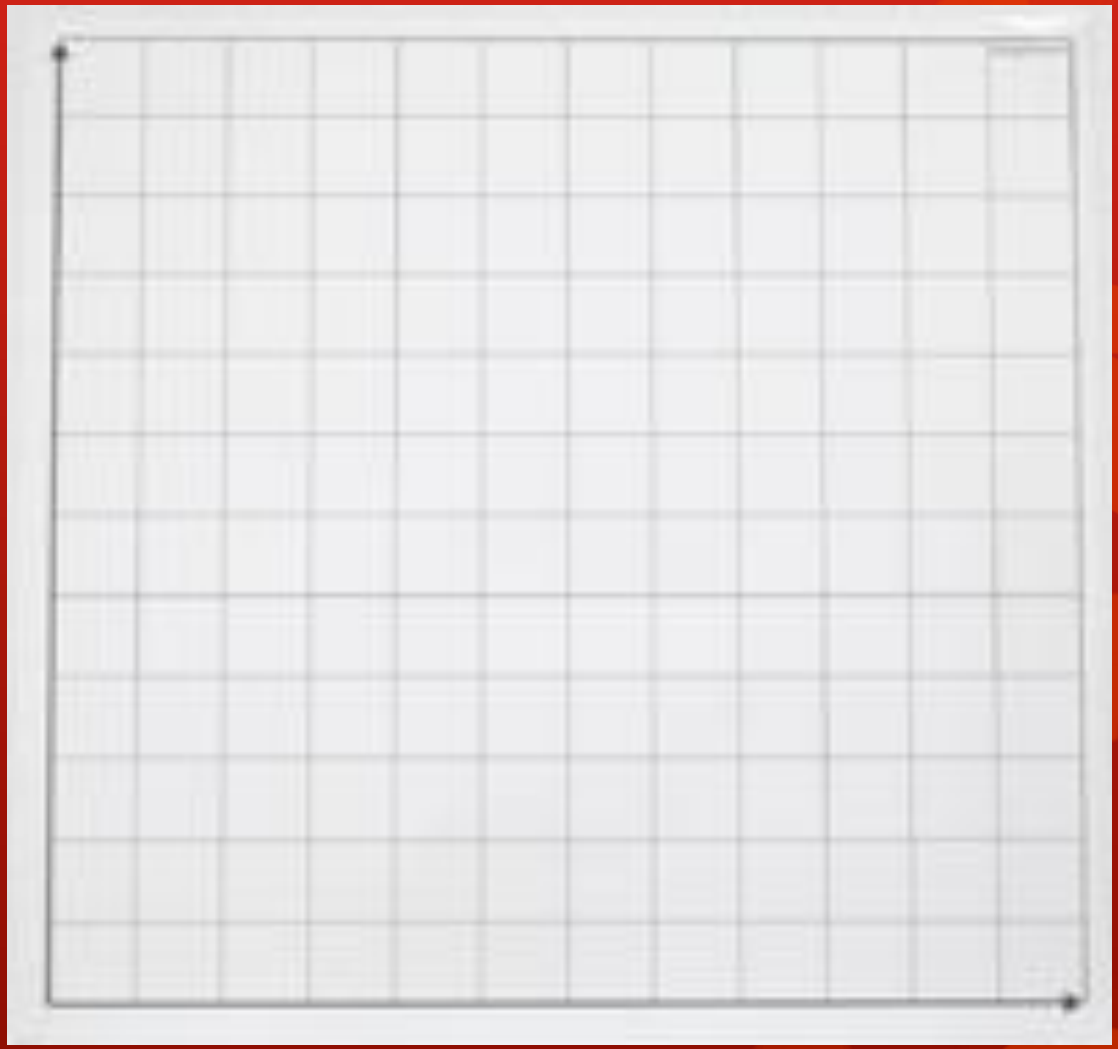
EX: Draw the graph that has the given intercepts.

- x-intercept: -5
- y-intercept: 6



EX:

- You make and sell hair bows. You sell small bows for $3 and large bows for $5. You want to earn $60 per week. This situation can be modeled by $3x + 5y = 60$ where x is the number of small bows and y is the number of large bows.
  - Find the intercepts of the graph.
  - What do they represent in this situation?
  - Graph the equation.
  - Give three possibilities for the number of each type of bow you can sell to earn $60.



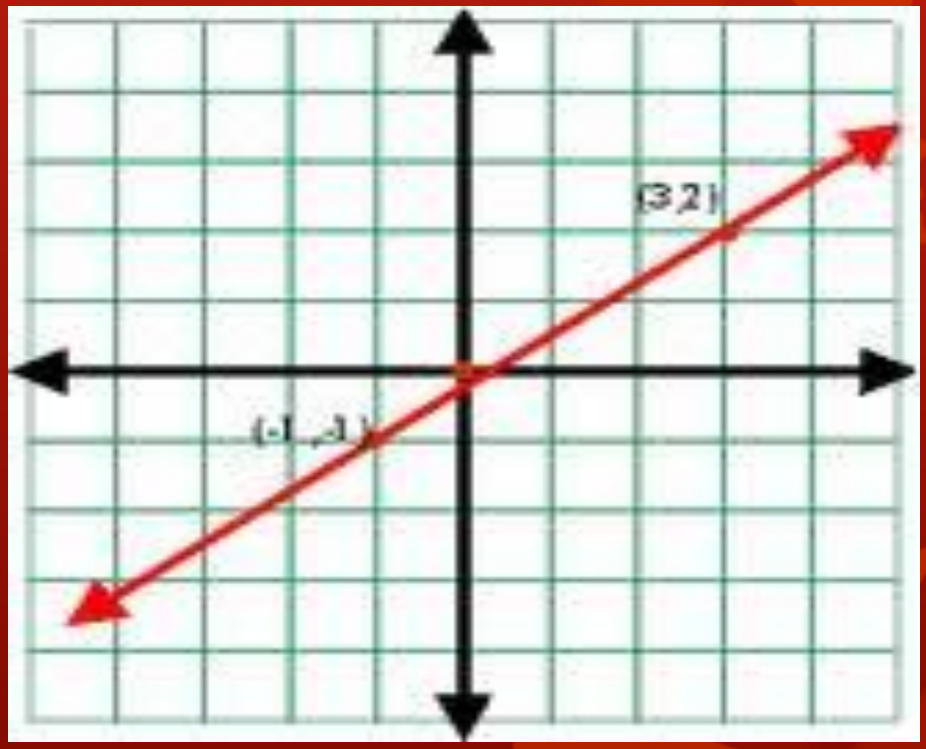
3.4 Find Slope and Rate of Change

Slope (m)

- The slope *m* of a nonvertical line passing through two points is the _____ _____.

- Slope Formula:

- EX:



Slope can be:

- **Positive** – if the line _____ from left to right
- **Negative** – if the line _____ from left to right
- **Zero** – if the line is _____
- **Undefined** – if the line is _____
  - Division by 0 is undefined

Slope

EXAMPLE:

EX: Find the slope of the line that passes through the points.

- (5, 2) and (4, -1)
- (0, 6) and (5, -4)
- (-2, 3) and (4, 6)
- (5, 2) and (5, -2)

EXAMPLE:

EX: Find the value or x or y so that the line passing through the given points has the given slope.

- (x, 9) , (-1, 19); m = 5
- (5, 4), (-5, y); m = 3/5

Rate of Change

- A **rate of change** compares a _____ to a _____.
- EX: You make $100 is 5 hours.

- **Your hourly wage is a rate of change that describes how your _____ changes _____ the _____working.**

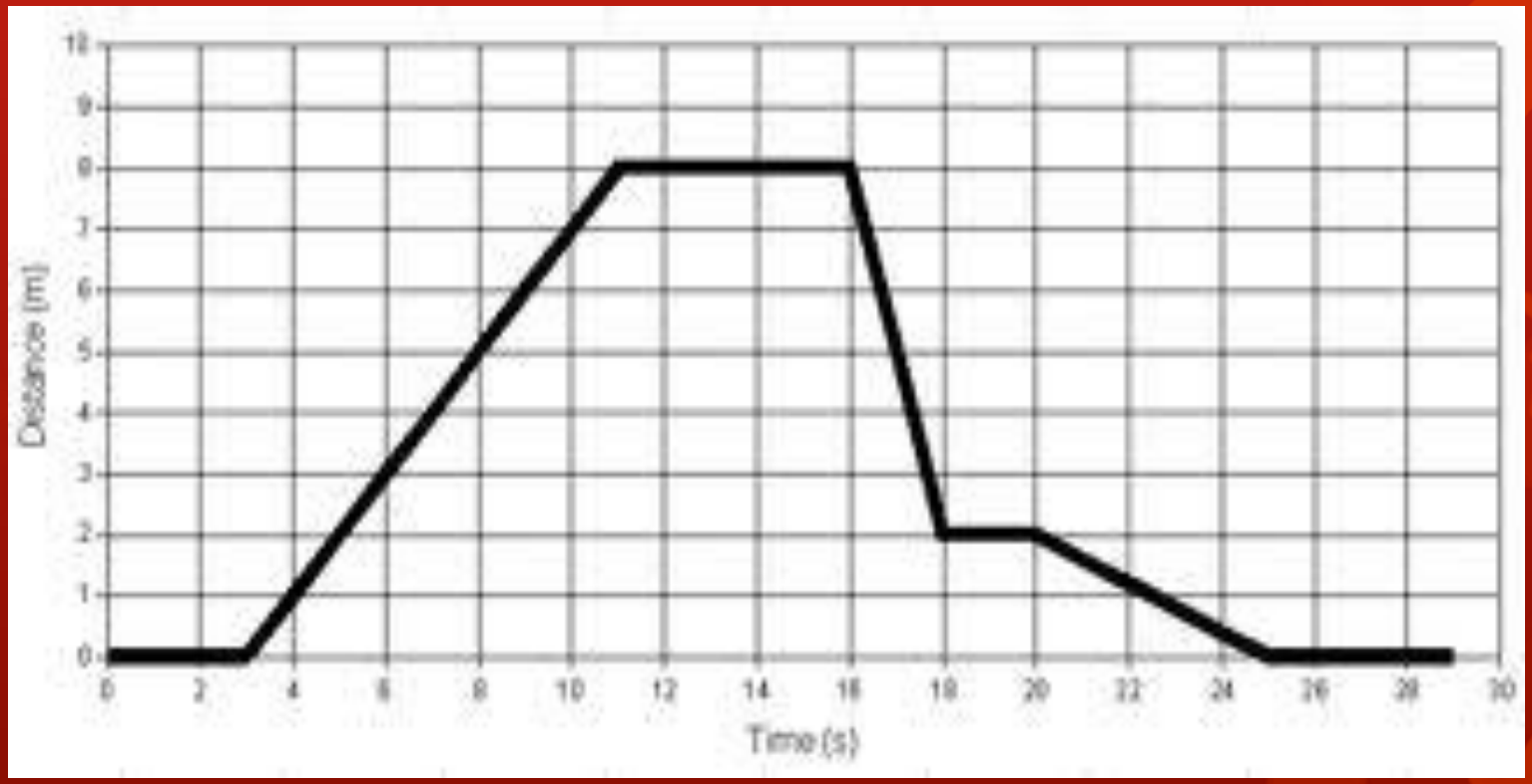
EX:

- The table shows the distance a person walks for exercise. Find the rate of change in **distance with respect to time.** And interpret its meaning.

Time (minutes)	Distance (miles)
30	1.5
60	3
90	4.5

- In a real-world problem, _____represents the _____.
- You can compare rates of change by comparing _____.
- EX: Rate of Change of Temperature
  - When was the rate of change of the temperature the least?

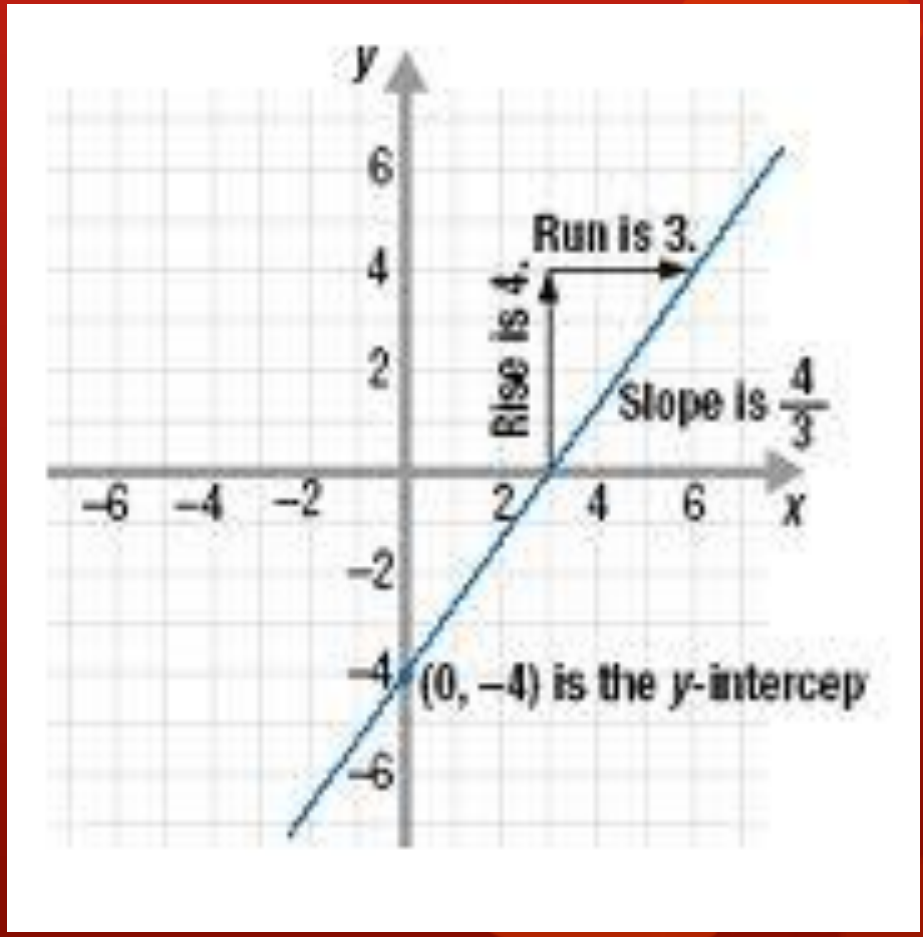
EX: The graph shows the distance of a driving car. Give a verbal description of the drive.



3.5
Graph Using Slope-Intercept Form

Slope-Intercept Form:

- _____
- **m** is the _____ of the line
- **b** is the _____ of the line
- Ex:



EXAMPLE:

EX: Identify the slope and y-intercept of the line with the given equation.

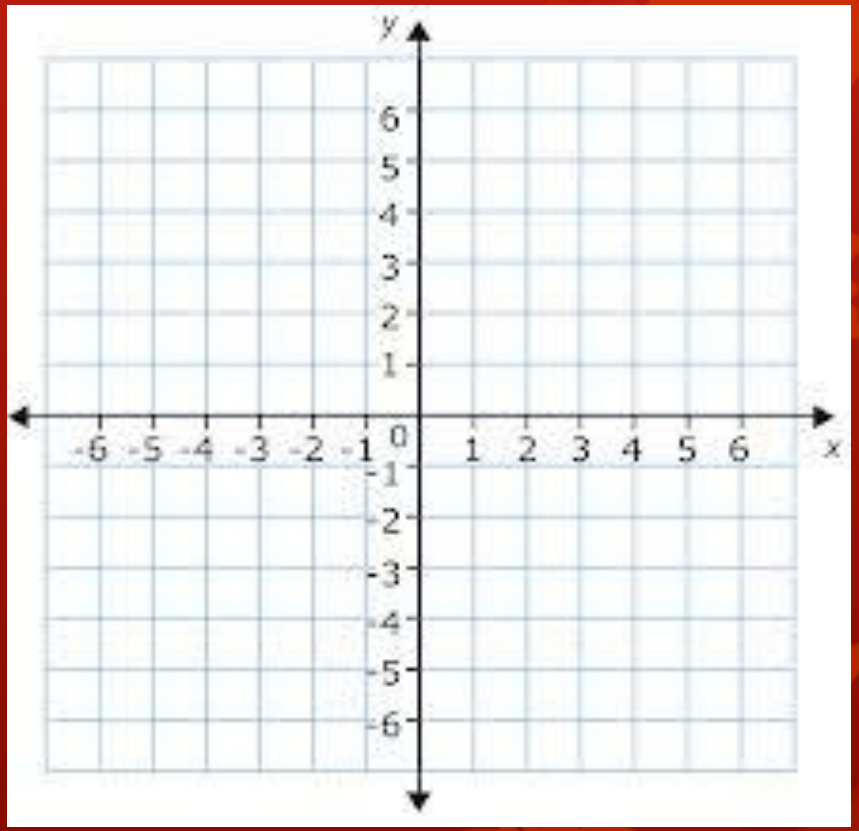
- $y = 3x + 4$
- $y = 5x - 3$
- $3x - 3y = 12$
- $x + 4y = 6$

Graphing Method 3: Slope-Intercept Form:

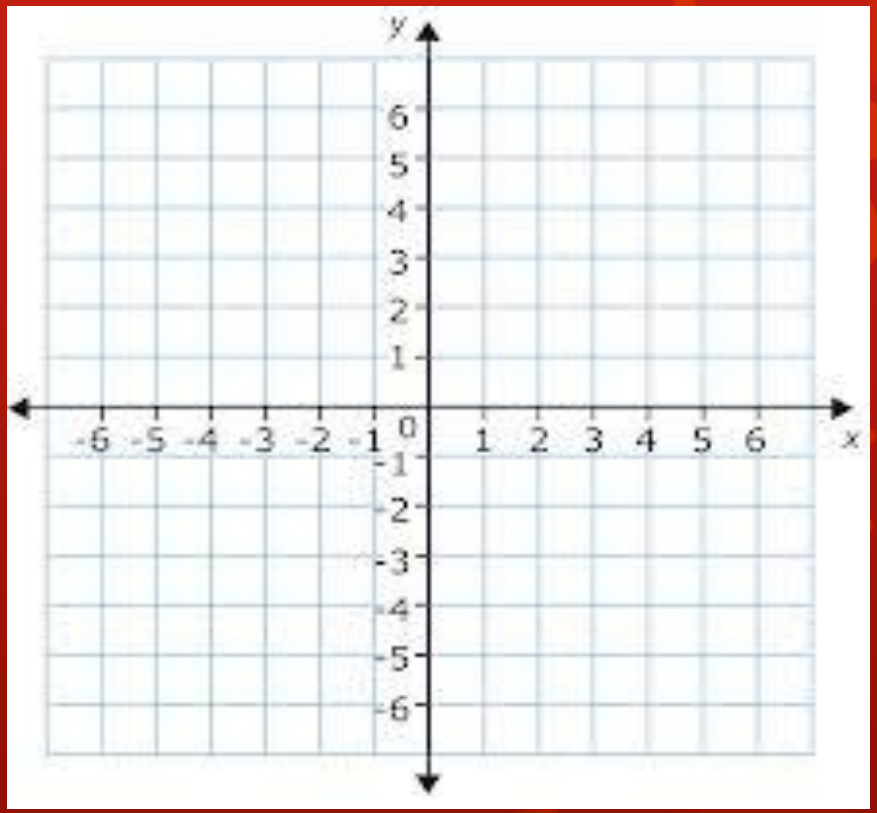
- 1) Rewrite the equation in _____.
- 2) Identify the _____and _____.
- 3) Plot the _____.
- 4) Use the _____ to find _____ on the line.
- 5) Draw a _____through the points.

EX: Graph the equation using slope-intercept form

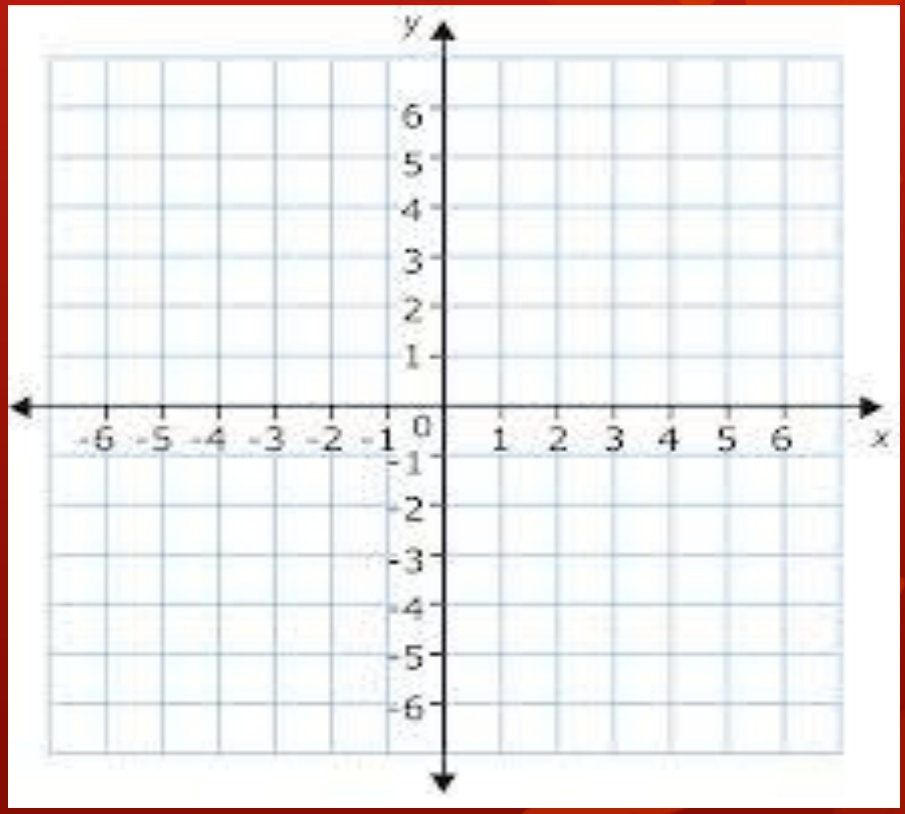
- y = 2x - 5



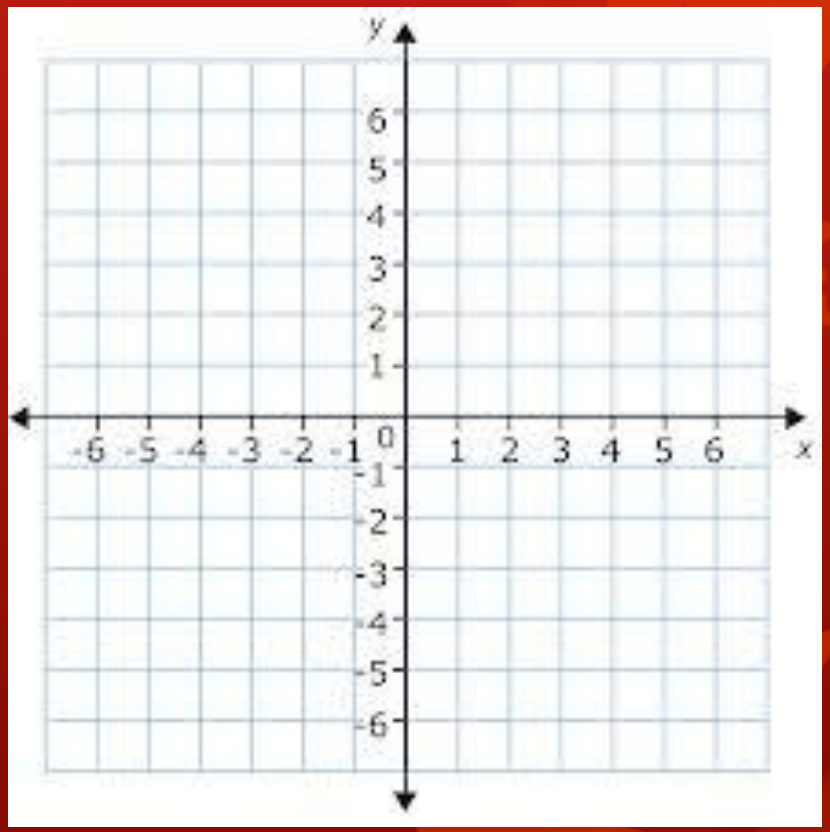
- $x + 2y = 4$



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



- $y = \frac{1}{3}x$



Slope-Intercept Form in Real Life

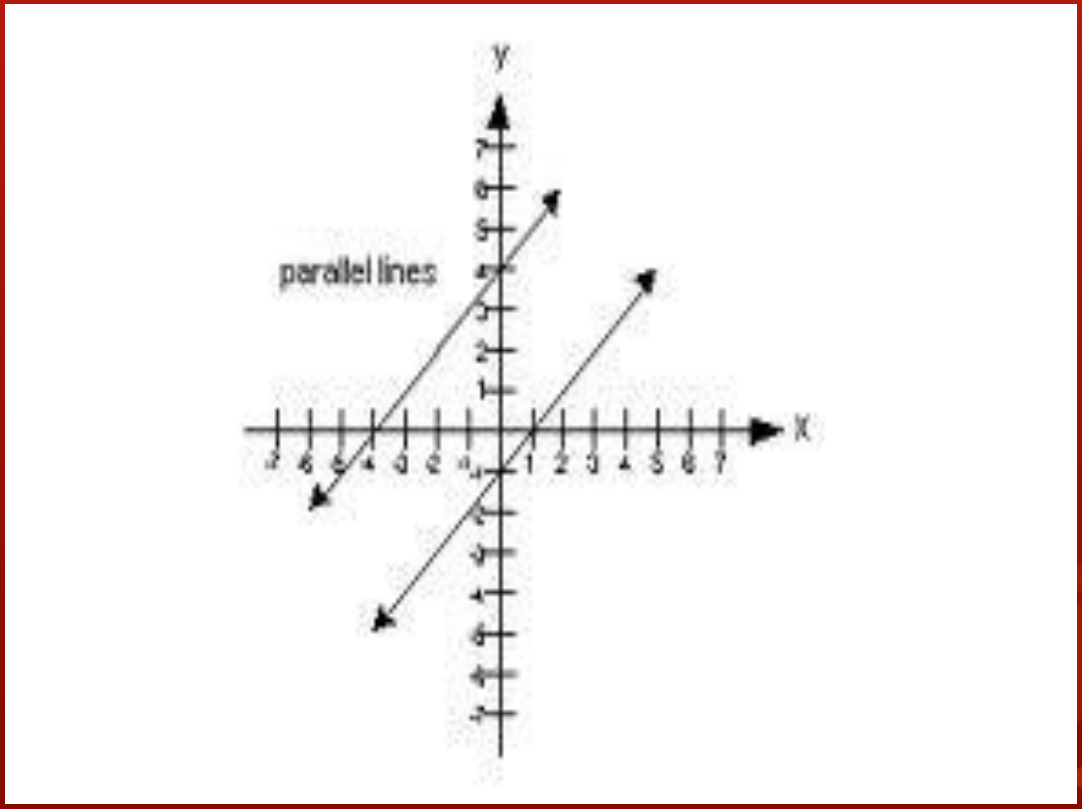
- In real-life problems:
- The _____ is the _____
- The _____ is the _____

EX:

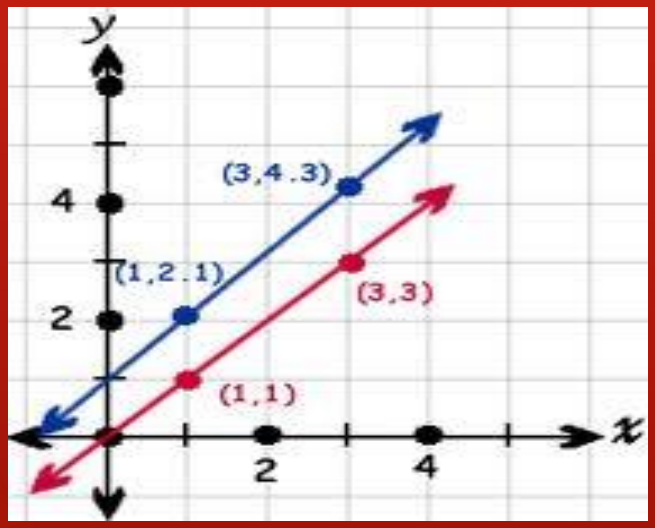
- We have 5 inches of snow on the ground. It is snowing at a rate of 2.5 inches per hour. Write an equation in slope intercept form to model the situation.
- If it snows for 8 hours, how much snow will we have?
- If we end up with 12 inches, how long did it snow for?

Parallel Lines

- **Parallel Lines** - Lines that _____.
- Parallel lines have _____ slopes.
- EX:



EX: Determine if the lines are parallel.



EXAMPLE:
EX: Tell whether the graphs of the two equations are parallel. Explain your reasoning.

- y = 3x + 2 and -7 + 3x = y

4x + y = 3 and x + 4y = 3

3.6
Model Direct Variation

Direct Variation

- Two variables **x** and **y** show direct variation provided that:

  _____.

- **"a"** is called the _____.
- y is said to _____ with x.

- EX: y = 7x

EXAMPLE:
EX: Tell whether the equation represents direct variation. If so, identify the constant of variation.

- Note: An equation represents direct variation if it can be rewritten in the form y=ax.
- 2x + y = 0
- -x + y = 1
- 4x – 5y = 0

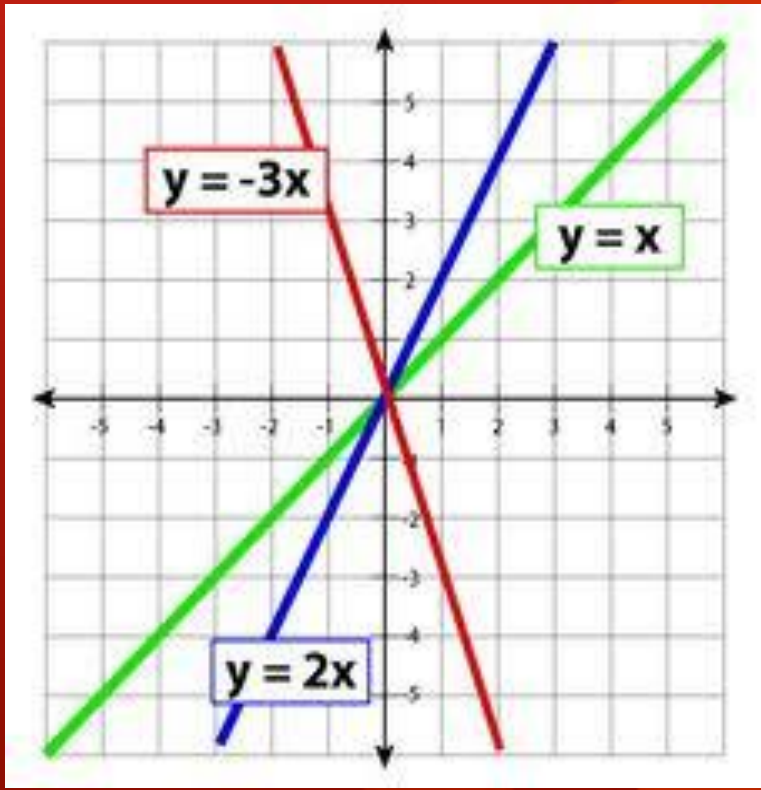
EXAMPLE:
EX: Given that y varies directly as x, use the specified values to write a direct variation equation that relates x to y.

- x = 3, y = -9

x = 14, y = 7

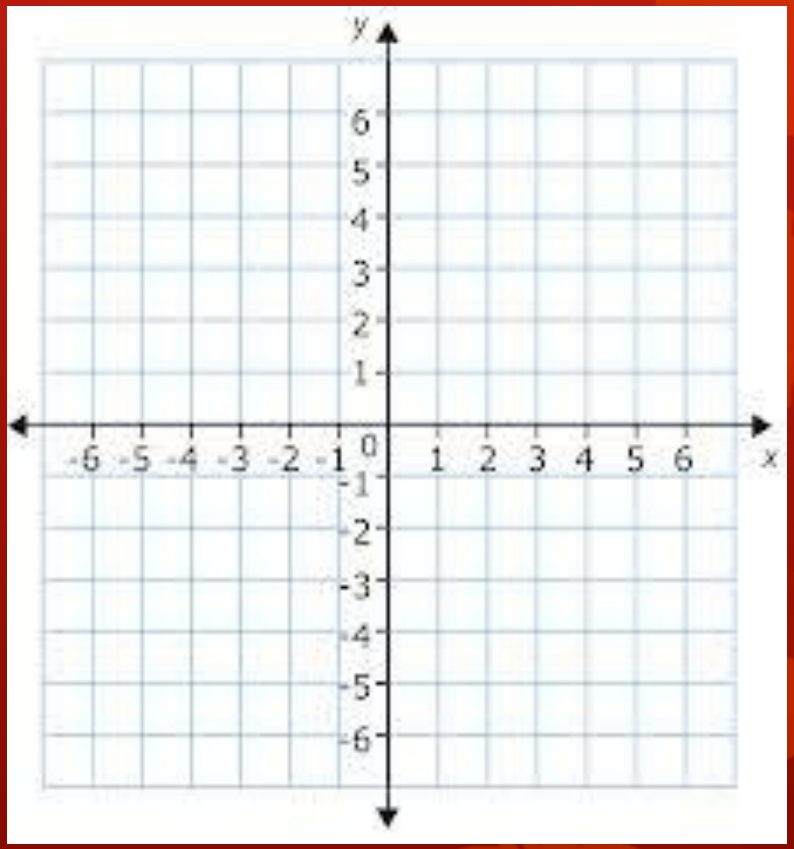
Graphs of Direct Variation Equations:

- The direct variation equation **y = ax** is in slope-intercept form with:
- "a" being the _____ of the graph
- _____ being the _____ of the graph
  - The graph will always pass through the _____.

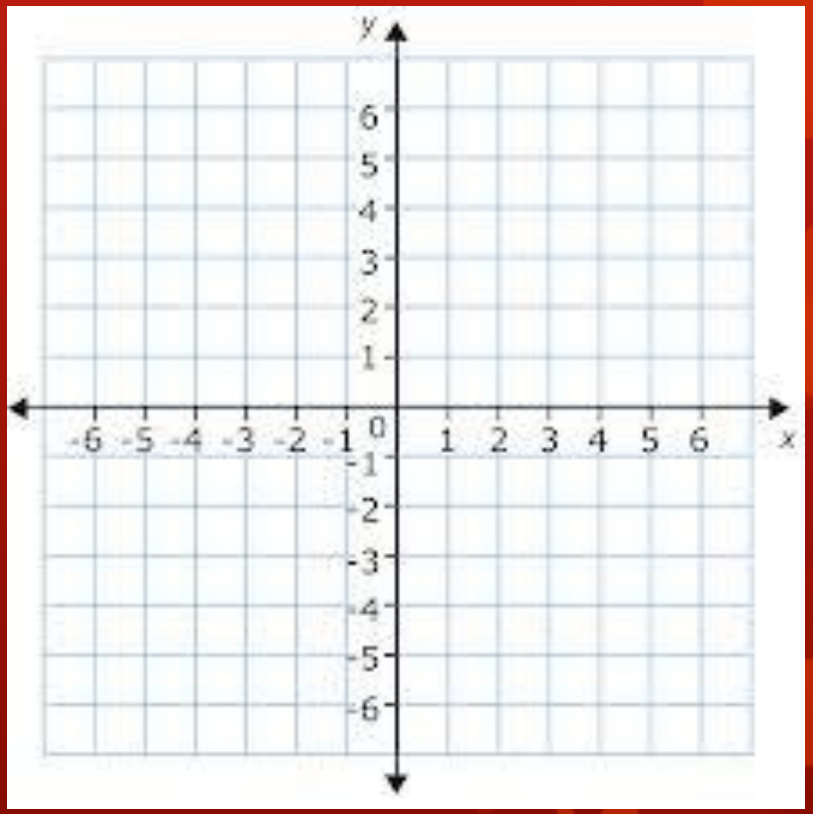


EX: Graph the direct variation equation.

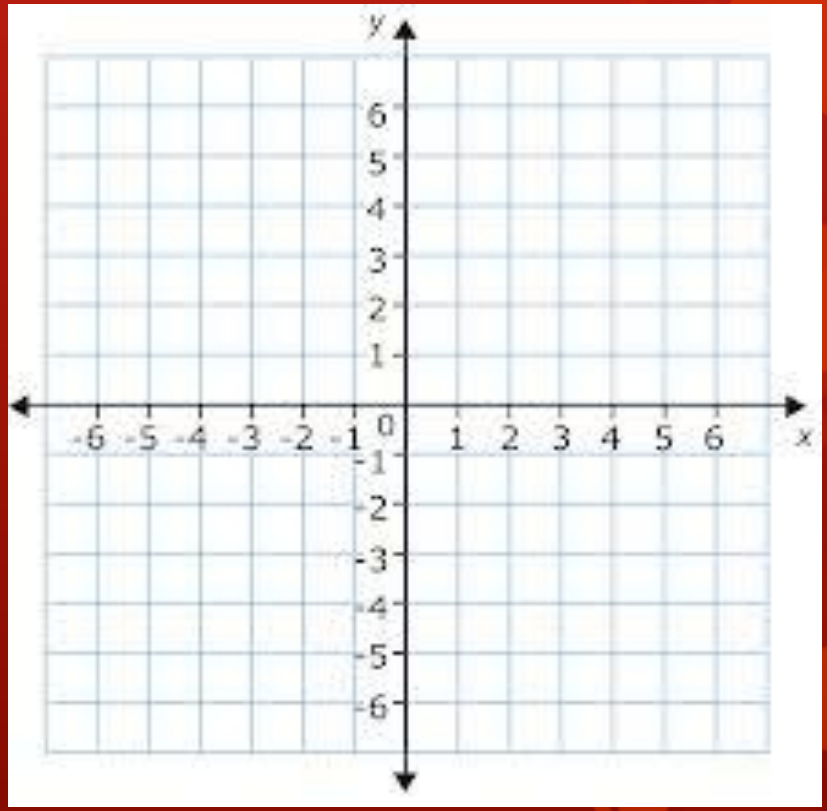
- y = -3x



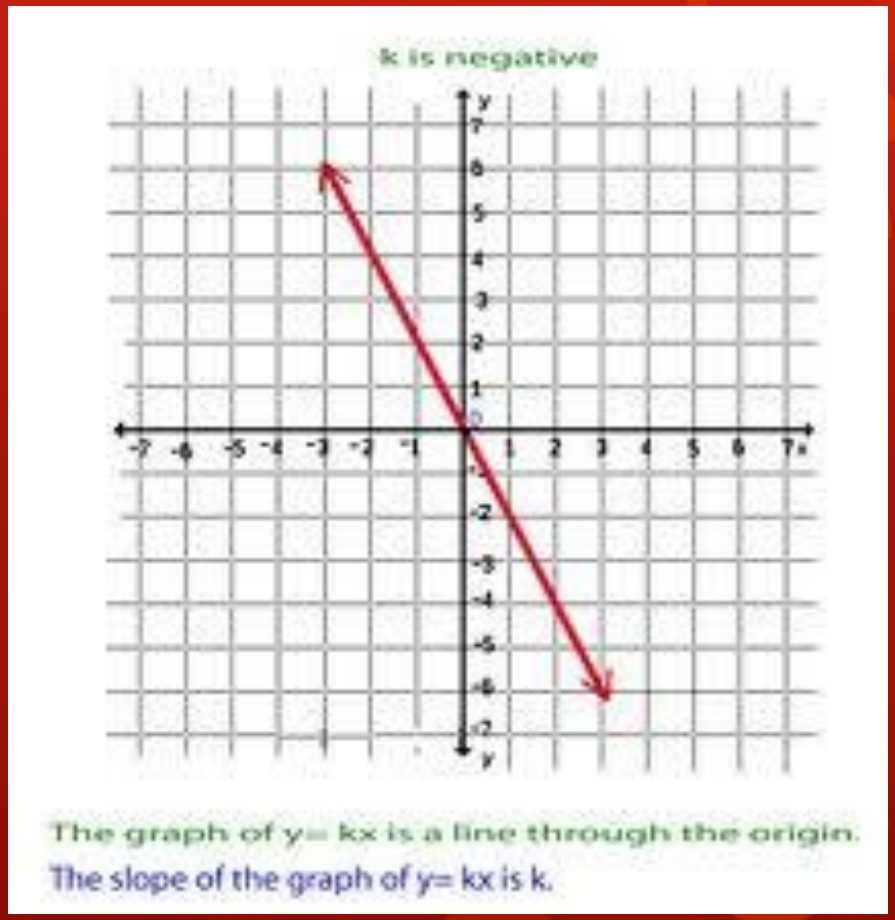
- $12y = -24x$



- $y - 1.25x = 0$



EX: Write the direct variation equation. Then find the value of y when x = 10



- The direct variation equation y = ax can be written as:

- Therefore the ratio of y to x is constant.
- EX:

x	−5	1	5	10
y	−35	7	35	70

EX:

- The table shows the cost of buying used DVDs at a music store.
- A) Explain why C varies directly with d.
- B) Write a direct variation equation that relates d and C.

Number of DVDs, d	Cost, C
3	$25.77
6	$51.54
9	$77.31

EX:

- An object that weighs 100 pounds on Earth would weigh just 6 pounds on Pluto. Assume that weight P on Pluto varies directly with weight E on Earth.
- A) Write a direct variation equation that relates P to E.
- B) What would a boulder weighing 750 pounds on Earth weigh on Pluto?

3.7
Graph Linear Functions

Functions

- Function – A pairing of _____and _____ such that _____ _____.
  - EX: y = mx + b
- Function notation : f(x) = mx + b
  - Replaces the _____.
  - f(x) is read as _____.
  - It does _____ mean _____.
  - You can also use other letters like _____.

EXAMPLE:

EX: Evaluate the function when x=-2, 0, and 3.

- $p(x) = -8x - 2$

$s(x) = \frac{2}{5}x + 3$

EXAMPLE:

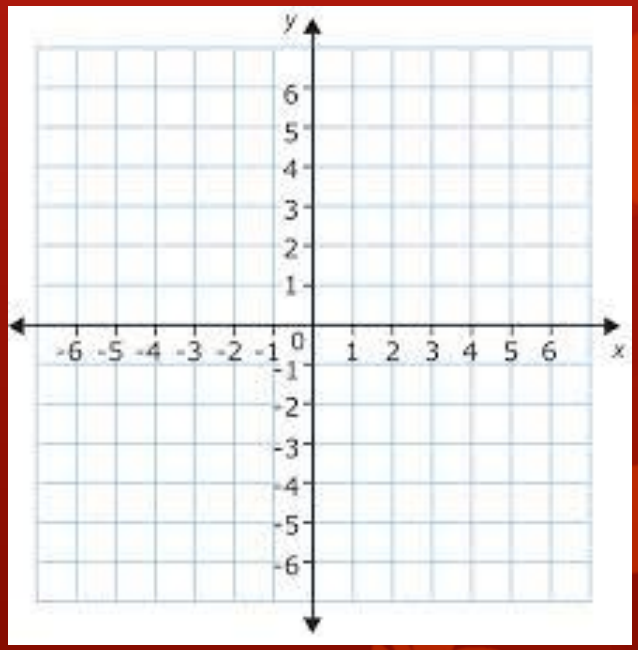
EX: Find the value of x so that the function has the given value.

- g(x) = -x + 5; 2

n(x) = -2x – 21; -6

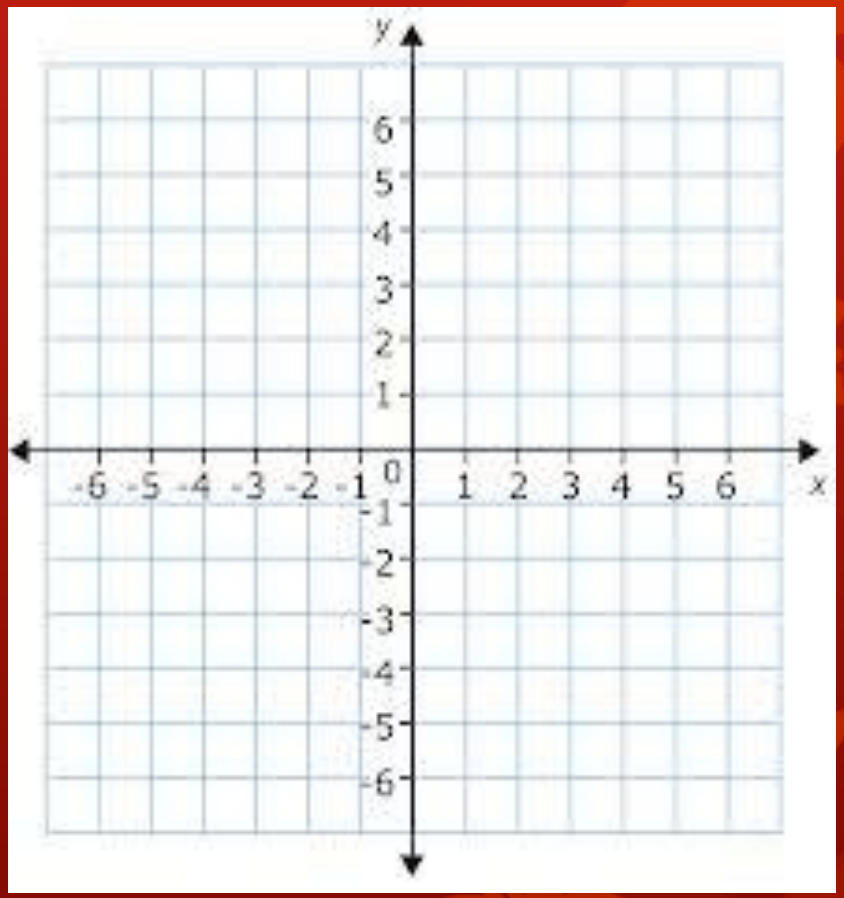
Graphing Functions

- To graph a function f(x) = mx + b
  - Replace the _____.
  - Then graph using _____: Plot the _____ and use the _____to find other points on the graph
- EX: Graph the function f(x) = x + 5

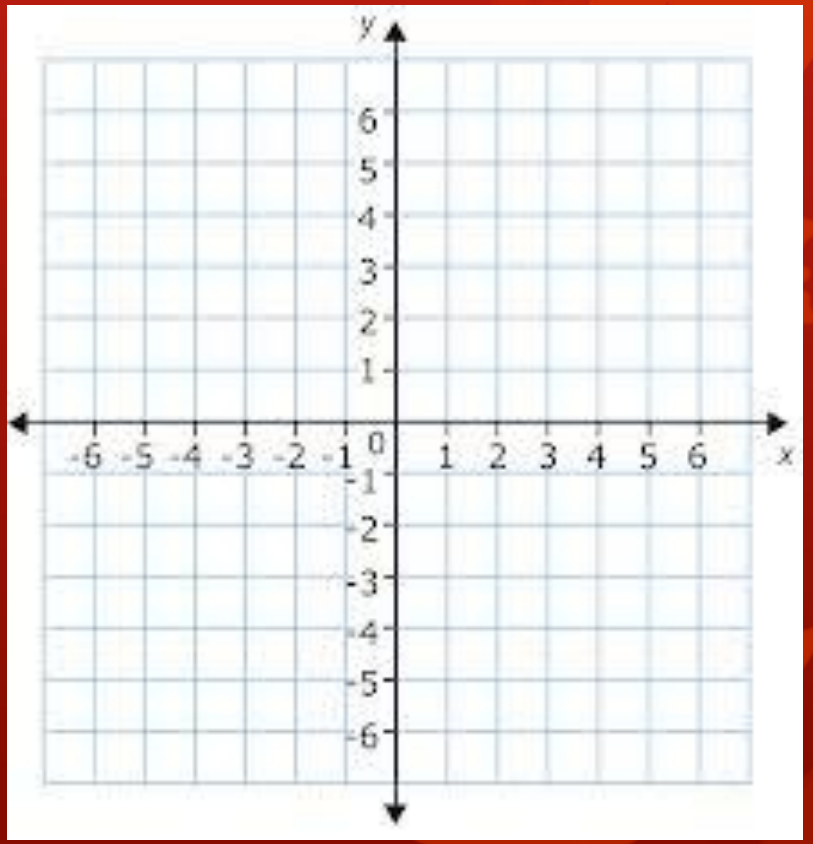


EX: Graph the function.

- $q(x) = x - 1$



- r(x) = 4x



- h(x) = -2x