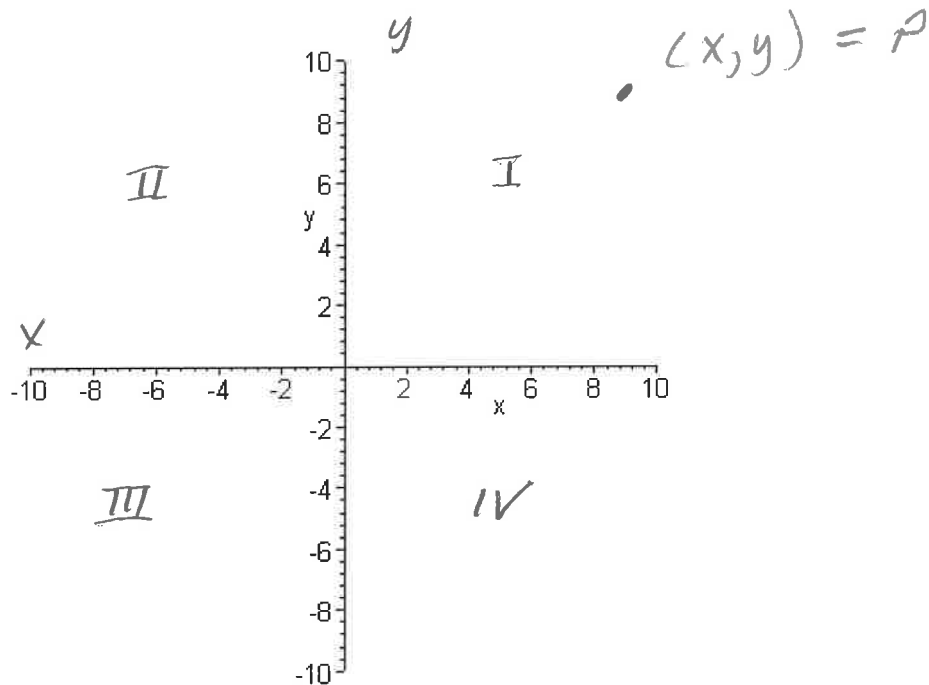


## Section 2.1 The Cartesian Coordinate System

Find the following on the rectangular coordinate system below: Origin,  $x$ -axis,  $y$ -axis, Quadrant I, Quadrant II, Quadrant III, Quadrant IV



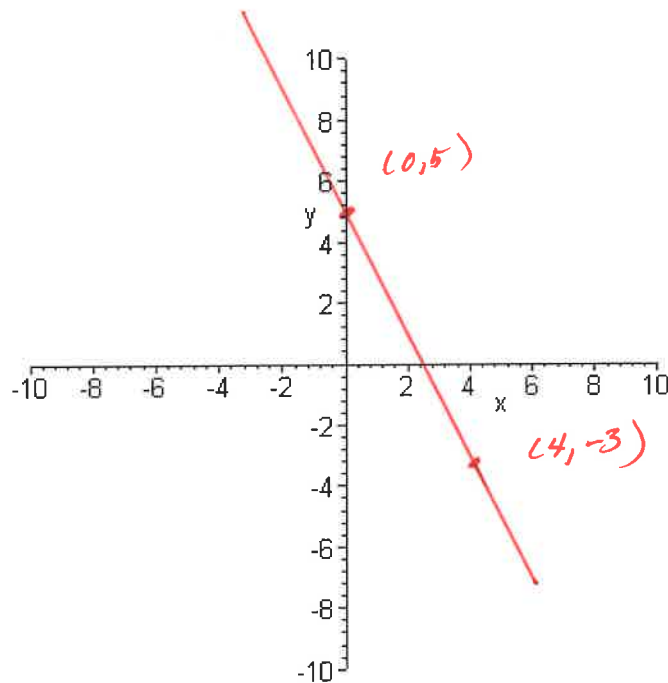
What does it mean to solve the equation below?

$$2x + y = 5 \quad \text{Find all pairs } (x, y) \text{ for which}$$
$$2x + y = 5$$

How would you show all of the solutions to the equation

$$2x + y = 5 \quad \text{Plot them}$$

Draw the graph of the equation  $2x + y = 5$  to model all of the solutions to the equation.



$(0, 5)$   
 $(4, -3)$

### **Big Idea!!**

**The graph of any equation is the set of solutions to the equation.**

*-When you are asked to graph an equation then you are being asked to give a visual representation of the solutions to the equation.*

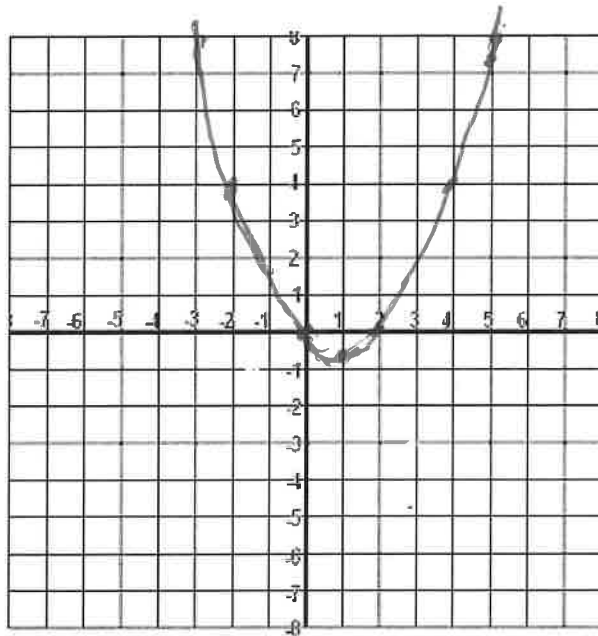
*-When you view a graph of an equation you are viewing the solutions to the equation.*

Draw a rough sketch of the graph of the equation

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

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

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



parabola

Best online graphing tool :

see website, Desmos

Draw a rough sketch of the graph of the equation

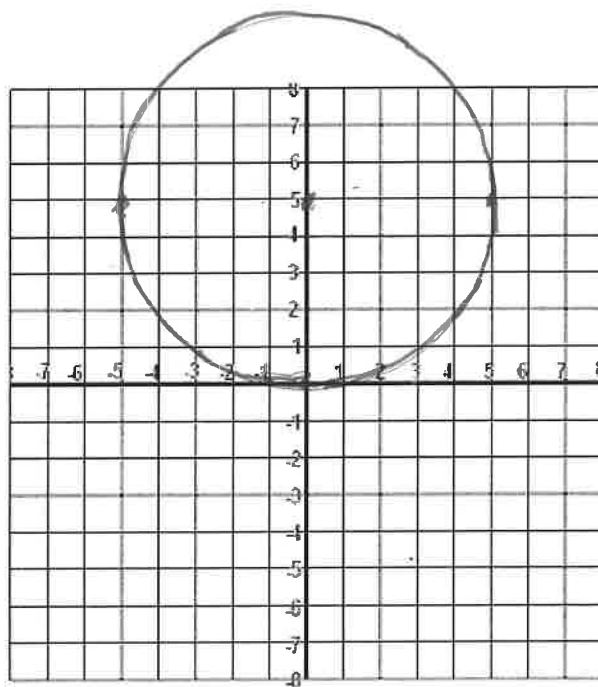
$$x^2 + y^2 - 10y = 0$$

$$x^2 + y^2 - 10y + 25 = 25$$

$$x^2 + (y - 5)^2 = 25$$

circle, center at  
(0, 5)

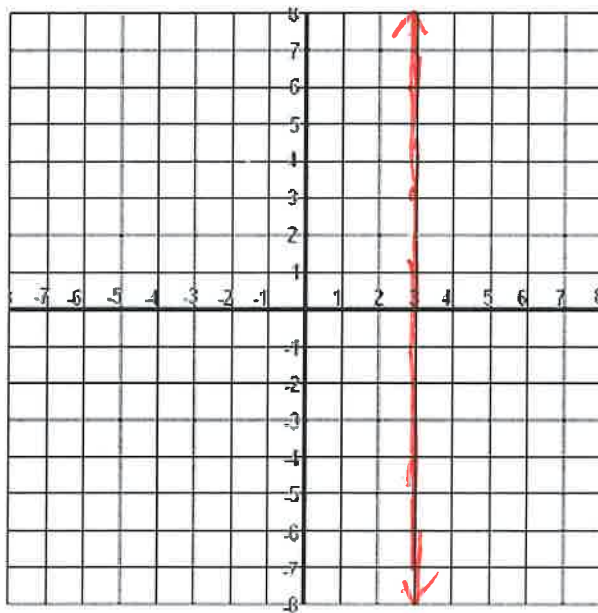
radius is 5



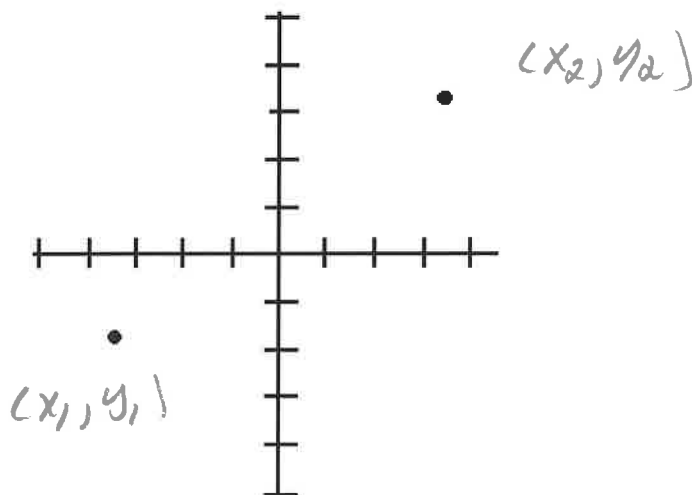
Draw a rough sketch of the graph of the equation  
 $x = 3$

*vertical line*

$x=3$



Find the distance between the two given points:



Distance Formula:

If point  $A$  has Cartesian coordinates  $(x_1, y_1)$  and point  $B$  has Cartesian coordinates  $(x_2, y_2)$  then the distance between point  $A$  and  $B$  is given by:

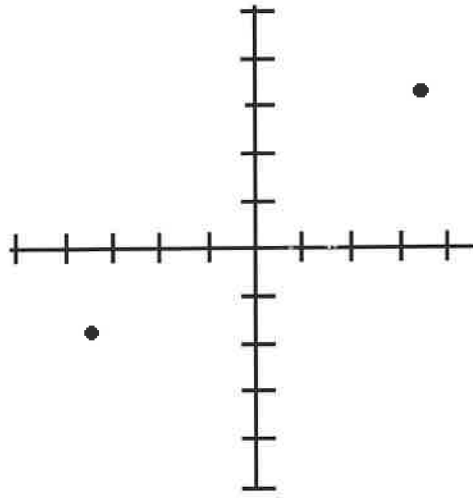
$$\text{distance} = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

Example:

Find the distance between the points whose Cartesian coordinates are  $(3, -1)$  and  $(2, \frac{5}{2})$ .

$$\begin{aligned} \sqrt{(3-2)^2 + (-1-\frac{5}{2})^2} &= \sqrt{1 + \frac{49}{4}} \\ &= \sqrt{\frac{53}{4}} = \frac{\sqrt{53}}{2} \end{aligned}$$

Find the midpoint of two given points:



Midpoint Formula:

If point  $A$  has Cartesian coordinates  $(x_1, y_1)$  and point  $B$  has Cartesian coordinates  $(x_2, y_2)$  then the midpoint is given by:

$$\text{Midpoint} \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Example:

Find the midpoint of  $(3, -1)$  and  $(2, \frac{5}{2})$ .

*Average the coordinates*

$$\left( \frac{3+2}{2}, \frac{-1+\frac{5}{2}}{2} \right)$$

$$\left( \frac{5}{2}, \frac{3}{4} \right)$$