Chapter 2.1 Graphs

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• **Coordinate system**: The x-y plane is divided into 4 regions by the x-axis (horizontal axis) and the y-axis (vertical axis). Starting in the top right quadrant we have quadrant one (QI) and going counter clockwise we have QII, QIII, and QIV. The spot where both axis cross is known as the origin.

• Coordinates are represented as ordered pairs and are written in the form (x,y). The origin has ordered pair (0,0)

• **Solutions of an equation**: To find if the ordered pair is a solution to the equation we take the order pair (x,y) and plug into the equation to see if we get a true or false statement. If the statement is true then the ordered pair **is** a solution to the equation. If the statement is false then the order pair is not a solution to the equation.

Example 1. Is (2,-1) a solution to $y = -2x + 3$? How about (4,7)?

(2,-1) :

$$-1 = -2(2) + 3$$
$$-1 = -4 + 3$$
$$-1 = -1$$

This statement is true and therefore (2,-1) **is** a solution.

(4,7) :

$$7 = -2(4) + 3$$
$$7 = -8 + 3$$
$$7 = -5$$

This statement is not true and therefore (4,7) **is not** a solution.

• **Sketching Graphs**: Since calculators are allowed on the test the easiest way to sketch graphs is by using your calculator. At home you can also use desmos which is a great tool for graphing on your computer. For those without graphing calculators graphing can be done via a t-chart. To use a t-chart it is simple, pick 4-5 x values (they can be any values you choose) and place them on one side of the table. Using these x values plug them in one at a time into equation for x and solve for y. Once you've solved for y write the number down on your t-chart. For every x you should have a y value, this will create an ordered pair which you can plot on graph. Once you have 4-5 points on your graph draw the line connecting the points.

Example 2. Sketch the graph of $y = -2x + 5$

Pick 4-5 x's say -2,0,5 and 6.for each of these take the x and plug into the equation above and solve for y. This will be done for the first x to demonstrate.

$$y = -2(-2) + 5 = 4 + 5 = 9$$

x	y
-2	9
0	5
5	-5
6	-7

Plot the points (-2,9) (0,5) (5,-5) and (6,-7) on a graph and draw line.

Note: In some cases like if theres a root or an x in the denominator you need to be careful which choosing x's and making sure that you don't choose x's that will create an error.

Example 3. Sketch the graph of $y = \sqrt{x + 2}$

In the case of roots the part under the root cannot be negative. Therefore to find what x's will be usable in the t-chart we need $x + 2 \geq 0$ Solving this by subtracting 2 from both sides we get $x \geq -2$ meaning we can pick any values of x greater then or equal to -2 for out t-chart. The rest of this problem is done the same as above.

• **x and y intercepts**: The x-intercept is the point where the line crosses the x-axis while the y-intercept is the point where the line crosses the y-axis. It is ok if a line has multiple x or y-intercepts.

• **How to find x-intercepts**: We know that the point where the line crosses the x-axis has a y value of 0. Using this, to find the x-intercept plug in zero for y in your equation and solve for x.

• **How to find y-intercepts**: We know that the point where the line crosses the y-axis has a x value of 0. Using this, to find the y-intercept plug in zero for x in your equation and solve for y.

Example 4. Find the x and y-intercepts of $y = x^2 - 2x - 8$

y-intercept:

$$y = 0^2 - 2(0) - 8 = -8$$

The y-intercept is -8.

x-intercept:

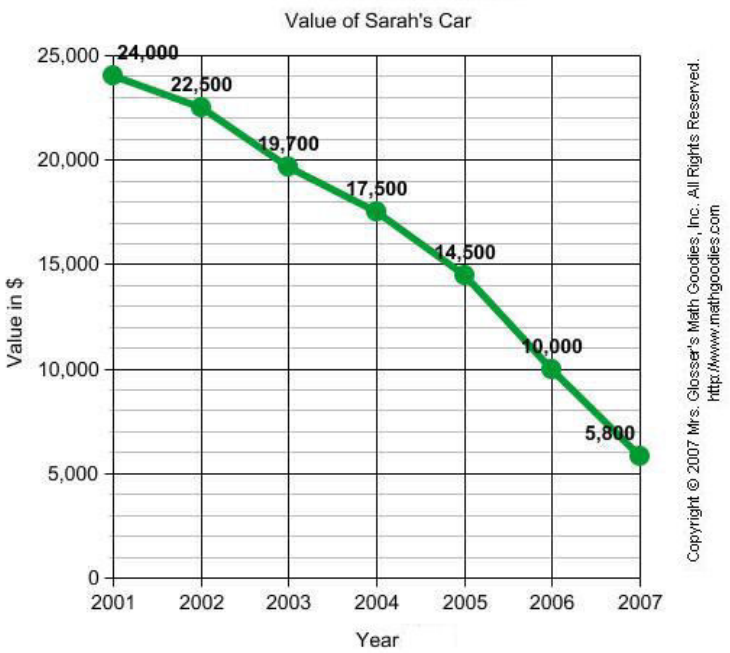
$$0 = x^2 - 2x - 8$$

Factor

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

$$x - 4 = 0 \rightarrow x = 4$$

$$x + 2 = 0 \rightarrow x = -2$$



Example 5.
Using the graph answer the following questions:
a) What was the value of Sarah's car in 2004?

First is to look at the year axis and find 2004, once found follow it up until you reach the line and then across to find the value if needed. In this case the value is $17,500.

b) What years did Sarah's car have a value greater then $15,00?

In this case we look at the value axis and find $15,000. We can imagine drawing a line at this point, any part of the graph that is above the line will be counted. The years that have a value greater then this are 2001, 2002, 2003, 2004.