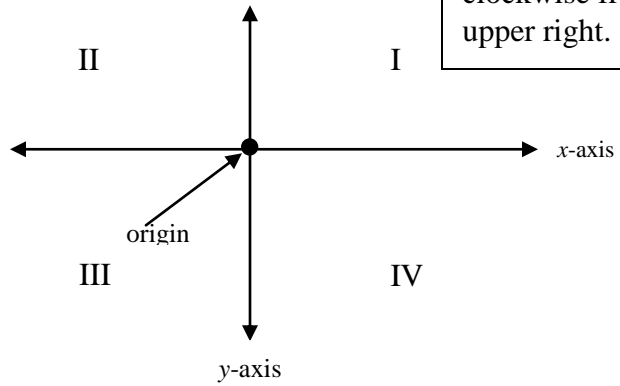


There are **4 quadrants**, represented by Roman Numerals counter-clockwise from the upper right.

I Rectangular Coordinate System

Rectangular Coordinate System:

Every point on a rectangular coordinate system is represented by an **ordered pair**, (x, y) . x and y are called the **coordinates** of the point.



Ex 1:

- a) In which quadrant(s) do the coordinates of a point have the same sign?
- b) In which quadrant would the point $(-2, 3)$ be found?
- c) The point $(12, 0)$ is found on which axis?
- d) What point would be 5 right and 6 down from the origin?

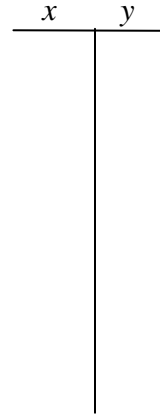
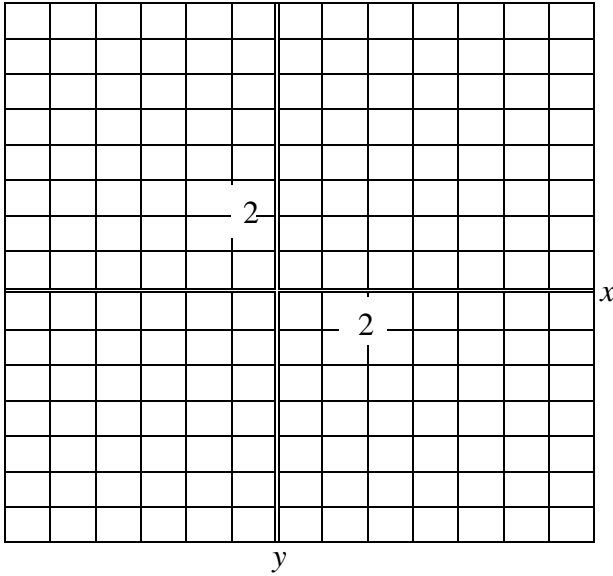
II Graphs of Equations

An equation in 2 variables can be represented on a rectangular coordinate system by plotting points (ordered pairs) that satisfies the equation. The complete graph contains all ordered pairs whose coordinates satisfy the equation.

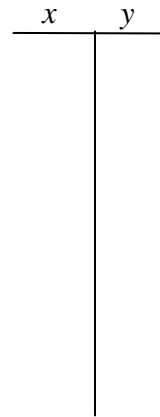
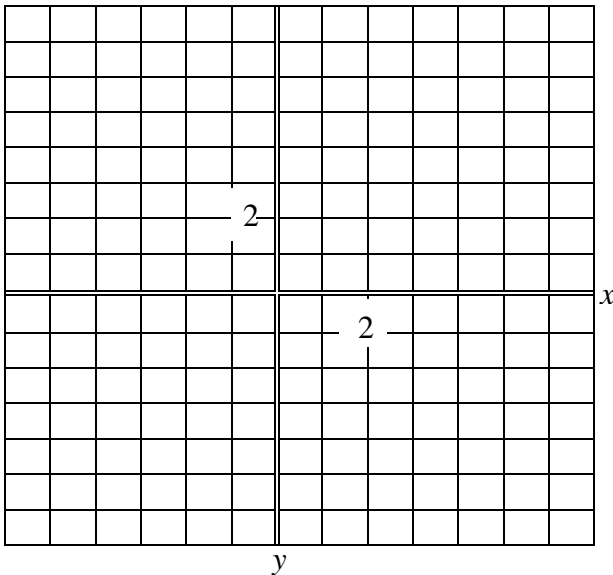
1. Make a table by selecting a value for x and solving for y (or vice-versa).
2. Plot enough points to be able to sketch a smooth curve or line to represent the graph.

Ex 2: Graph the following equations. Use the values of $-3, -2, -1, 0, 1, 2$ and 3 for x .

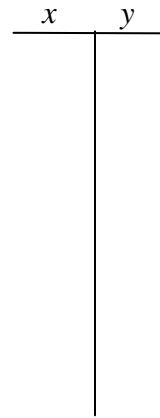
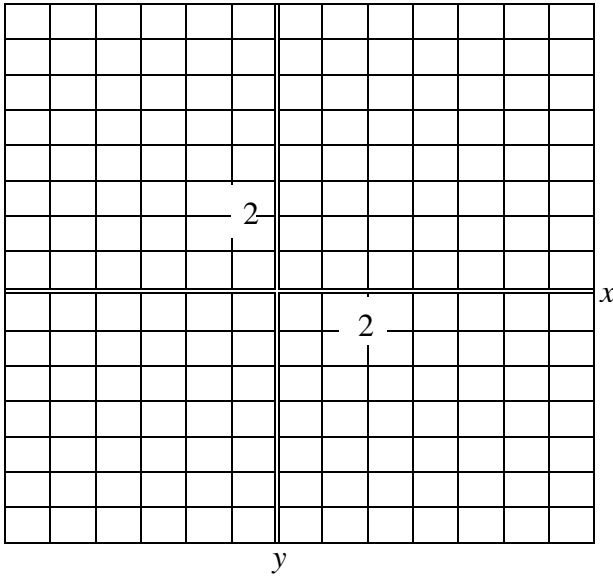
a) $y = 3 - x^2$



b) $y = \left| \frac{1}{2}x \right|$



c) $y = -\frac{1}{2}x^3 + 1$

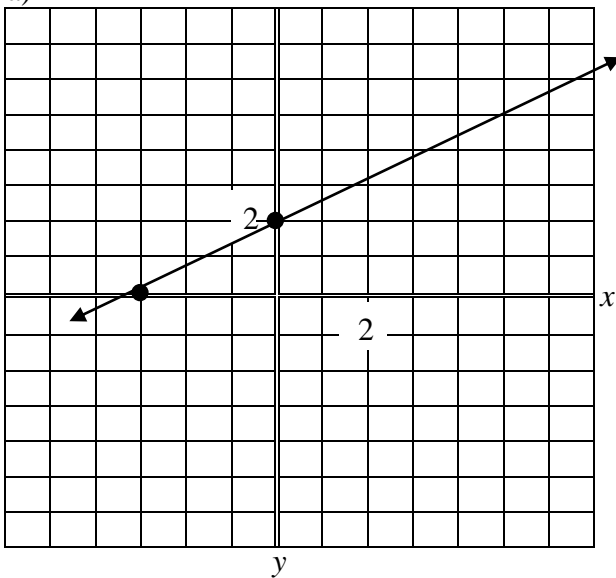


II Intercepts

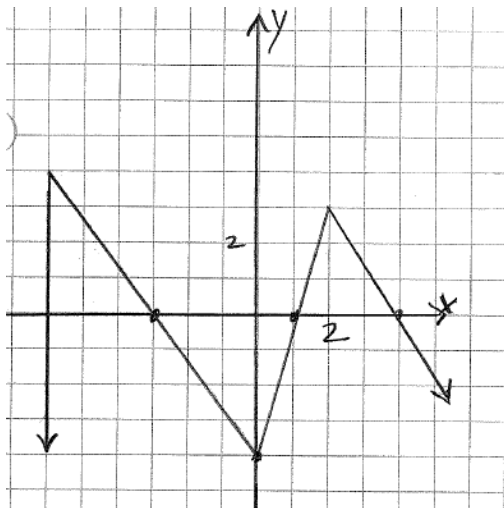
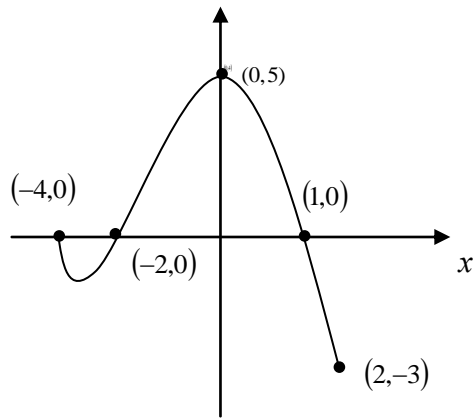
An **x-intercept of a graph** is an x -coordinate of a point where the graph intersects the x -axis. The **y-intercept of a graph** is the y -coordinate of a point where the graph intersects the y -axis. Yes, our textbook uses single numbers to describe intercepts. Some textbooks use the complete ordered pair to define the intercepts. (See the study tip at the bottom of page 94 of the textbook.) Since an intercept always lies on an axis, the coordinate other than the one given as the x -intercept or y -intercept is zero. Zero is your friend!

Ex 3: Use the following graphs to identify the intercepts.

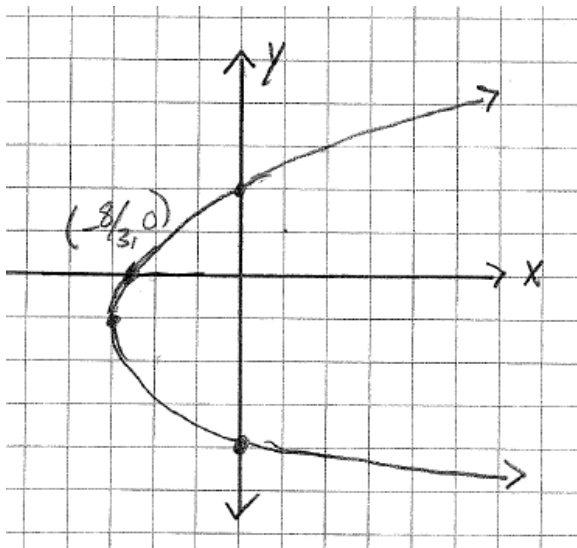
a)



b)



c)



d)

III Applied Problems

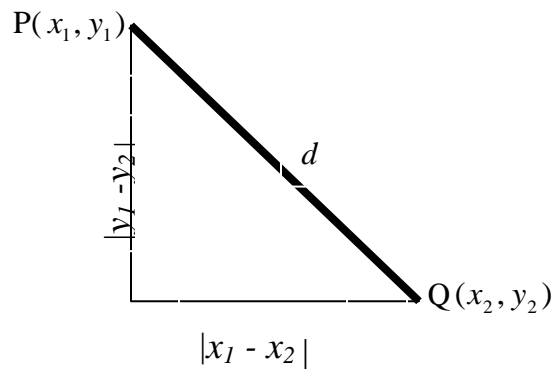
On page 96 of your textbook is a graph showing the probability of divorce by the wife's age at the time of marriage. The two mathematical models that approximate the data displayed in the graphs are $d = 4n + 5$ (where d = the percentage of marriages ending in divorce for n years after the marriage for a wife under 18 at time of marriage) and $d = 2.3n + 1.5$ (for a wife over 25 at time of marriage).

- Ex 4:
- Use the graph to approximate the percentage of marriages ending in divorce after 5 years of marriage if the wife was under 18.
 - Use the correct model (formula) to approximate the percentage of marriages ending in divorce after 5 years of marriage if the wife was under 18.
 - Does the value given by the mathematical model underestimate or overestimate the actual percentage of marriages ending in divorce after 5 years for a bride under 18 shown in the graph? By how much?

IV Distance Between 2 Points on a Coordinate System

Notation for points: Points are labeled using capital letters. Sometimes a point may be written as follows: $P(x_1, y_1)$. This is read 'point P with coordinates of x sub 1 and y sub 1.

To find the distance between two points, the Pythagorean Theorem could be used.



Distance Formula:

$$d^2 = (x_1 - x_2)^2 + (y_1 - y_2)^2$$

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

The second line is known as the **distance formula** between two points.

Ex 5: Find the exact distance (in simplified form) between the 2 given points.

a) $P(0,5), Q(6,-3)$

b) $P(3,-3), Q(-5,5)$

Ex 6: Approximate the distance between the 2 given points to the nearest hundredth.
 $(2.6, -3.1), (-8.5, 2.1)$

Midpoint Formula:

The **midpoint** of two point P and Q is the point midway between P and Q. Its coordinates are the average of the x coordinates of P and Q and the average of the y coordinates of P and Q.

The midpoint of $P(x_1, y_1)$ and $Q(x_2, y_2)$ is $M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.

Study Tip page 295: The midpoint requires sum of the coordinates. The distance formula requires difference of the coordinates.

Ex 7: Find the midpoint of each pair of points.

a) $P(0,5), Q(6,-3)$

b) $P(4,-3), Q\left(-5, \frac{3}{2}\right)$

(optional)

Ex 8: Determine if a triangle with the following vertices is an **equilateral triangle**.
 $A(13,-2)$, $B(9,-8)$, $C(5,-2)$