SECTION 1.1 – INTRODUCTION TO GRAPHING

Any equation where x and/or y are both to the first power will be the graph of a line. Linear equations are often in the form $y = mx + b$, where m is the slope and b is the y-intercept. If m is positive the line will rise from left to right. If m is negative, the line will fall from left to right.

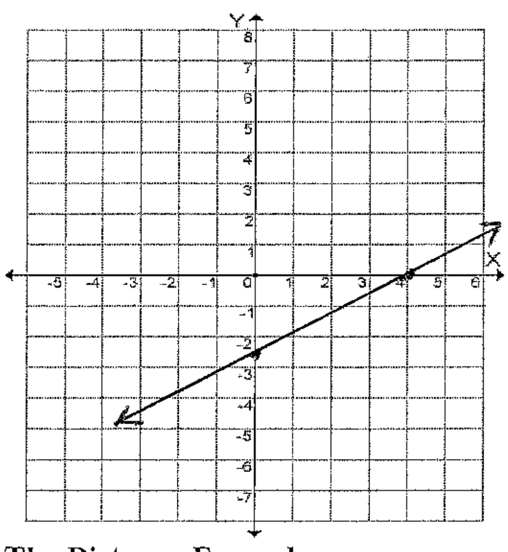
Any equation in the form $y = ax^2 + bx + c$ can be called a quadratic. Its graph will be a parabola (a U- shaped graph). The parabola will open up if $a > 0$ and open down if $a < 0$.

To find the **x-intercept(s)** set $y = 0$ and solve for x. To find the **y-intercept(s)** set $x = 0$ and solve for y.

For most of the course, y will be replaced by $f(x)$ resulting in function notation.

When graphing a line, plot at least 3 points. For something other than a line, plot enough points to create the general shape.

Ex. 1: Graph $2x - 3y = 8$ by finding the x and y intercepts.



y INT $\Rightarrow x = 0$

$2(0) - 3y = 8 \qquad y = -\frac{8}{3}$ or $(0, -$

x INT $\Rightarrow y = 0$

$2x - 3(0) = 8 \qquad x = 4$ or $(4, 0)$

The Distance Formula:

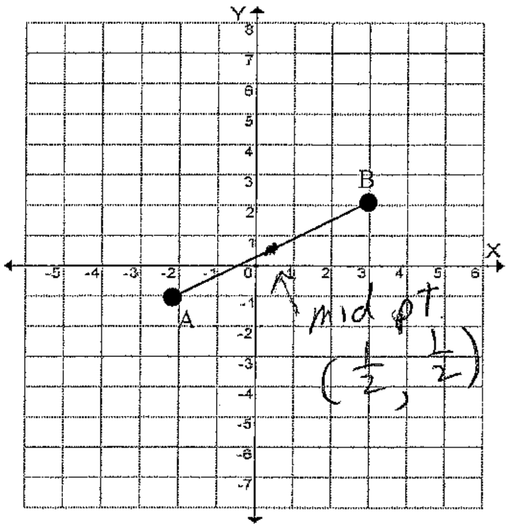
The distance between the points (x_1, y_1) and (x_2, y_2) is given by

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

The Midpoint Formula:

If the endpoints of a line segment are (x_1, y_1) and (x_2, y_2), the coordinates of the midpoint are $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

Ex. 2: Given pts $A(-2,-1)$ and $B(3,2)$;



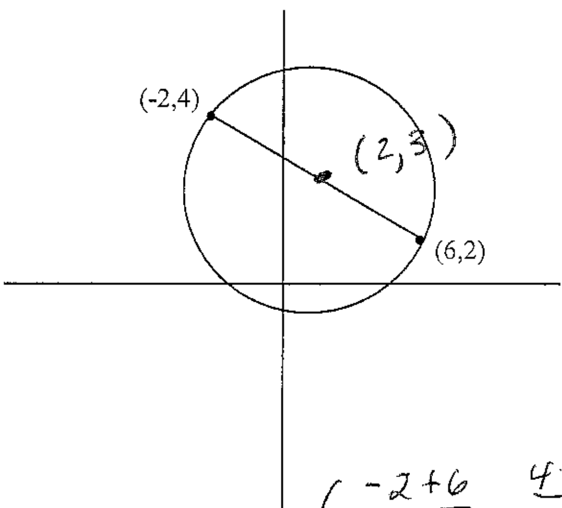
a) Find the distance between A and B.

$$\boxed{\begin{aligned} d &= \sqrt{(x_1 - x_2) + (y_1 - y_2)^2} \\ &= \sqrt{(3+2)^2 + (2+1)^2} \\ &= \sqrt{25+9} = \sqrt{34} \end{aligned}}$$

b) Find the midpoint of the line segment $\overline{AB}$. Decide if your answer makes sense by comparing it to the graph.

$$\boxed{\begin{aligned} mp &= \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) \\ &= \left(\frac{3-2}{2}, \frac{2-1}{2}\right) = \left(\frac{1}{2}, \frac{1}{2}\right) \end{aligned}}$$

Ex. 3: The points (–2, 4) and (6, 2) are the endpoints of the diameter of a circle. Find the radius and center. **Hint: Application of midpoint and distance.**



Find center: $\left(\frac{-2+6}{2}, \frac{4+2}{2}\right)$

$(2,3)$

Find radius $r = \sqrt{(2-6)^2 + (3-2)^2}$

$= \sqrt{17}$

Circles:

A **circle** is the set of all points in a plane that are a fixed distance (r) from a point. The equation of a circle with center (h,k) and radius r in standard form is: $\mathbf{(x-h)^2 + (y-k)^2 = r^2}$

Derived from the Pythagorean Theorem, this form should remind you of $a^2 + b^2 = c^2$.

Ex. 4: Give the center and radius of the following circles.

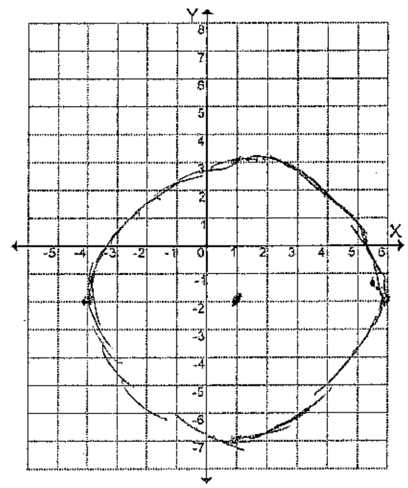
a) $(x-1)^2 + (y+2)^2 = 25$

Center: $(1,-2)$

Radius: $r^2 = 25$

$r = 5$

"count 5 in all directions"



Sketch the graph

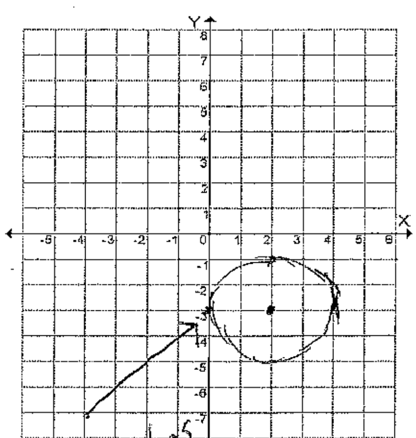
Ex. 5: Write the equation of a circle with a diameter of 5 and a center of (–2, 4).

$$\text{radius} = \frac{1}{2}\text{diameter} = \frac{5}{2}$$

$$(x-h)^2 + (y-k)^2 = r^2$$

$$(x+2)^2 + (y-4)^2 = \left(\frac{5}{2}\right)^2$$

Ex. 6: Find the equation of a circle with center (2,–3) that is tangent to the y-axis. Use the grid below to sketch the graph.



Touches here

picture "helps"

radius is "countable"

$r = 2$

$$\boxed{(x-2)^2 + (y+3)^2 = 4}$$