## College algebra

We will glance over many review topics and probably some new stuff for you.

The Rectangular Coordinate System, Graphs of Equations, Intercepts, Distance Formula, Equations of Circles (Section 1.1)

Cartesian Plane: The Cartesian plane (or simply the $x y$-plane) is shown below. Familiarize yourself with its parts. Remember a point's coordinates are alphabetical, $x$ then $y$ or $(x, y)$.


Graphs of Equations: The graph of an equation in two variables shows us every point ( $x, y$ ) that satisfies the equation (or makes it true). Consider the equation $y=x^{2}-3$. Complete the table below and then look at the graph I have provided.

| $x$ | $y=x^{2}-3$ |
| :---: | :---: |
| -3 |  |
| -2 |  |
| -1 |  |
| 0 |  |
| 1 |  |
| 2 |  |
| 3 |  |



Finding $x$ - and $y$-intercepts: The $x$ - and $y$-intercepts of a graph are where the graph intersects the $x$ and $y$ axes.

expl 1: Find the intercepts of $5 x-6 y=60$. Graph on your calculator to check.


Distance Formula: Below are two points on a plane. If we want to find the distance between them, we can draw in a right triangle (picture on right) and use the Pythagorean Theorem. Notice in particular how the legs of the triangle are figured.



Could you use this triangle to find the distance between the two points?
We will now use two points in general to derive the formula for the distance between them. The procedure is similar to the example above.


Follow the steps below to derive the distance formula. We start with the Pythagorean Theorem and replace the variables with the pieces of our triangle.

$$
\begin{aligned}
& c^{2}=a^{2}+b^{2} \\
& d^{2}=\left(x_{2}-x_{1}\right)^{2}+\left(y_{2}-y_{1}\right)^{2} \quad \circ \\
& d=\sqrt{\left(x_{2}-x_{1}\right)^{2}+\left(y_{2}-y_{1}\right)^{2}} \quad \circ
\end{aligned}
$$

 hypotenuse, and the legs in

Square root both sides to get $d$ alone. This is what is known as the distance formula.
expl 2: Use the distance formula to find the distance between the two points $(5,-4)$ and $(10,6)$. Give an exact distance and a three-decimal place approximation.

$$
d=\sqrt{\left(x_{2}-x_{1}\right)^{2}+\left(y_{2}-y_{1}\right)^{2}}
$$

## Worksheet: Things to know about your calculator:



This worksheet is a laundry list of things I have found useful over the years. Try out everything it mentions. Instructions for the TI83 should work for the TI84 calculators.

## Worksheet: Getting started on your graphing calculator:

This is an introduction to home screen operations, graphing, window settings, and the TRACE function. Instructions for the TI83 should work for the TI84 calculators.

## Equations of Circles:

A circle is the set of all points $(x, y)$ equidistant from a single point $(h, k)$ called the center. Using $r$ for the radius (the distance between the center and any point on the circle) and the distance formula, we get the equation $r=\sqrt{(x-h)^{2}+(y-k)^{2}}$. Square both sides and you get the following formula.

The equation of a circle is given as $(x-h)^{2}+(y-k)^{2}=r^{2}$. The point $(h, k)$ is the center and $r$ is the radius.
expl 3: Find the center and radius of the circle below. Then draw a quick xy-plane and graph the circle on paper.
$(x+6)^{2}+(y-3)^{2}=25$
expl 4: Find the equation of a circle that has a center of $(6,-5)$ and passes through the point (1, 7).


