Systems of Non-Linear Equations

Thursday, January 19, 2012
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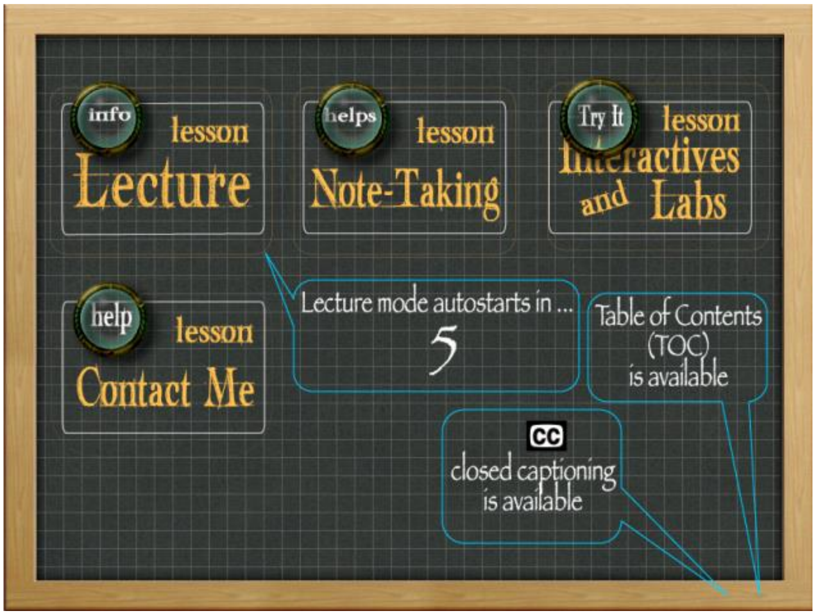
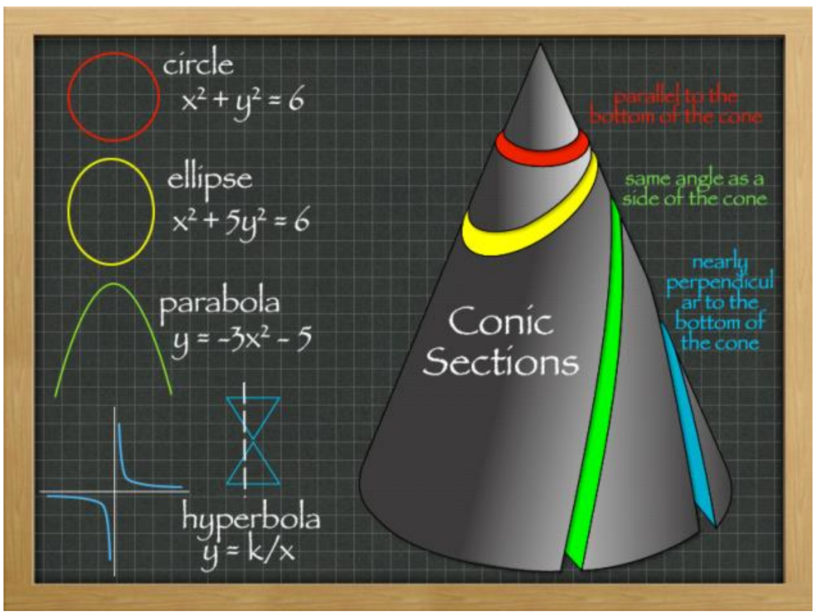
Slides | Notes





We have spent a great deal of time on linear relationships and touched on one conic section so far. In this lesson you will be introduced to a few more conic sections.

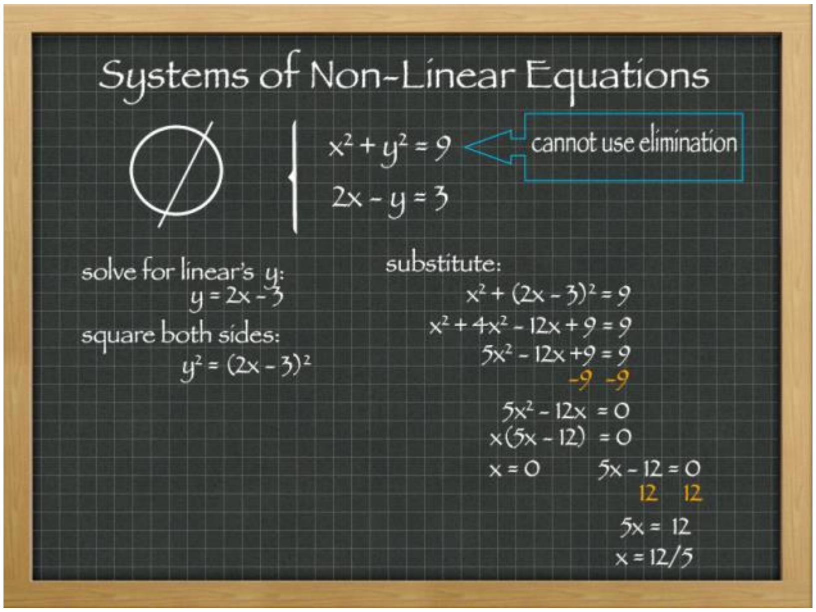
Conic sections get the name because you can get the function graphs when you cut slices through a cone.

To get a circle, you slice through at an angle parallel to the bottom of the cone. Here is and example of the equation for a circle. Note the x- squared and the y-squared.

An ellipse is when you slice through at any angle that doesn't cut through the bottom of the cone and are not parallel to the bottom as a circle is. Notice that it too has an equation with an x-squared and y-squared, but there are coefficients in front of them.

A parabola will slice through the cone going through the base of it because the angle is always the same as the side of the cone. You have been working with quadratic equations already. Those are parabolas when graphed. Though not in standard form, you can tell this equation is a quadratic equations because of the single x-squared

A hyperbola will cut through the bottom of the cone but will not be parallel to the side of the cone. You will often see these paired as if there was a cone upside down above this one when it was sliced. When graphed, the shape is similar to a curved v versus the smoother curve of the parabola. They will get closer and closer to lines that form a 90 degree angle but they will never touch or cross it. If you graph an inverse proportionality, this is the graph type that will be created.



In this system of equations, you have a linear equation, which will make a straight line when graphed, and a circle conic section equation. What you are looking to find will be the x and y coordinates of where the two intersect, or are simultaneous.

We will solve for the x-axis components of the pair first. We cannot use the elimination method here, so we will use substitution.

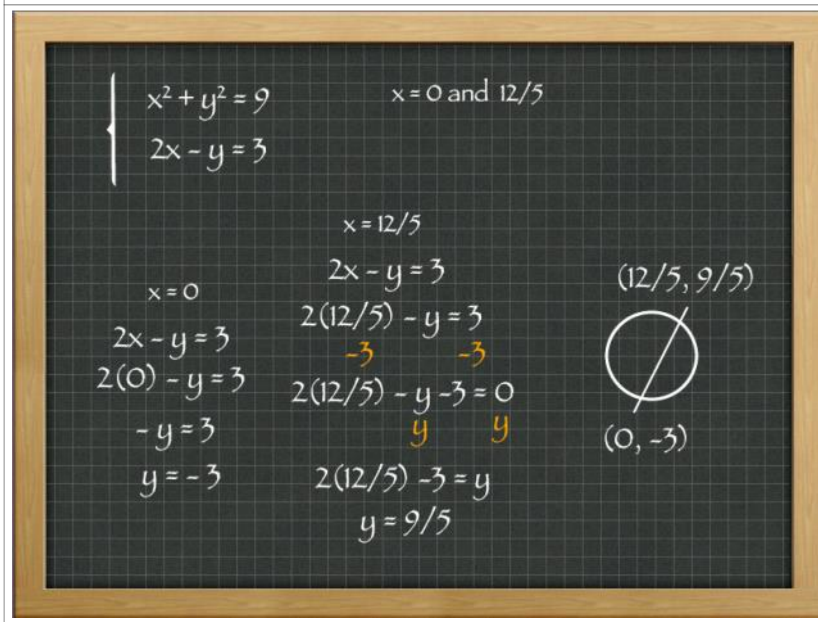
We will shuffle around the linear equation to solve for y.

This cannot yet be substituted, but we will be able to if we square both sides so that we have a y-squared.

Now we can substitute. We will get rid of the squared 2x - 3 and simplify. Then we want it all set to zero so we can get the root of the equation, so we will move the 9 off to the left side. There is an x in both terms, so we will pull that out. Now if the x out front is a zero the equation will be true. Also, if the part in the parentheses total a zero the statement will be true, so we will set that part equal to zero and solve it.

So the two x-axis pieces of the puzzle are now solved. Now we need the y-axis parts.

Put one in here that will need the quadratic equation because of the quadratic step not being factor able (see lesson 86.c Call them irrational roots.

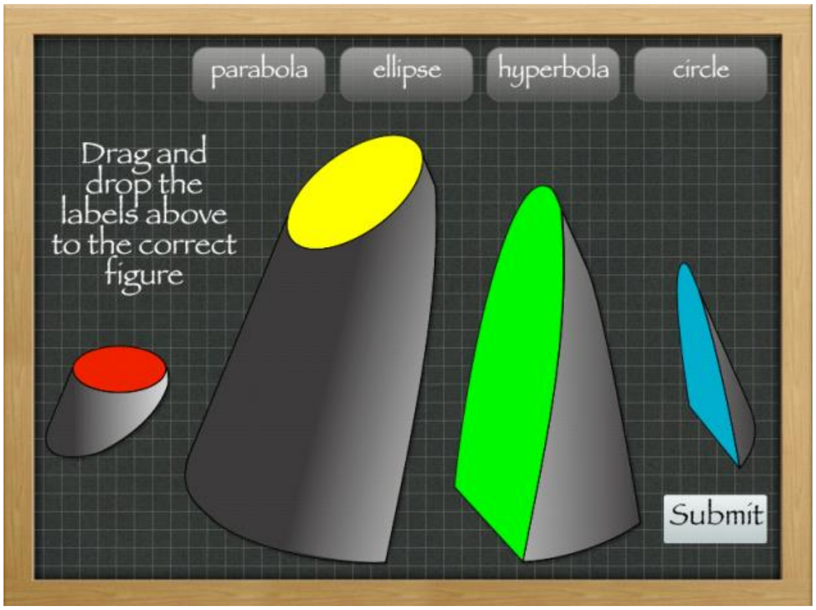


We will make a quick note of what we got for x in the previous slide. X = 0 and 12/5.

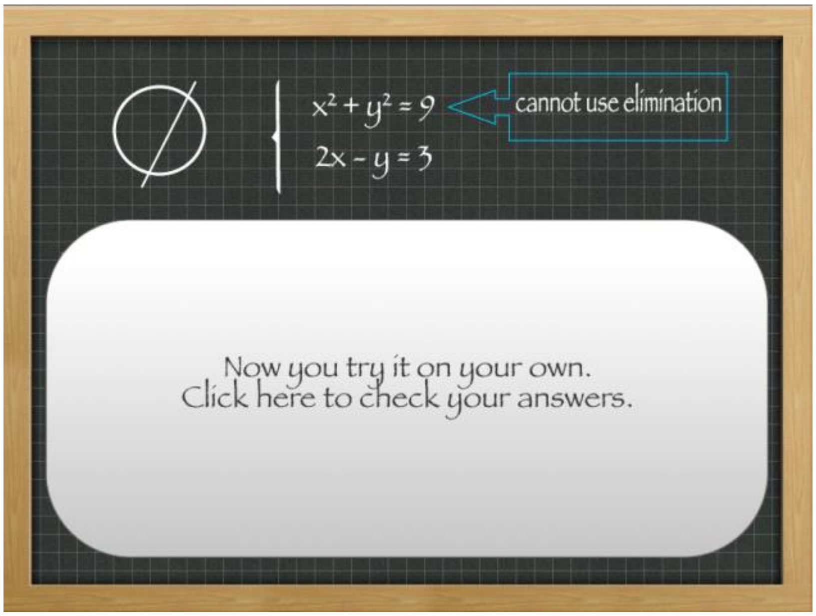
So, working with x = 0, we are going to take that second equation, just because it is easier to work with, and solve for what y has to be.

Then we are going to do the same with x = 12/5. That gives us what the y will b e in that instance.

Now we know what our answer is. When our x is 12/5 our y is going to be 9/5. When our x = 0 our y is -3. We can track where the circle and line intercept.



Try it 1



Try it 2