Conics Homework – The Ellipse: From Definition to Equation*

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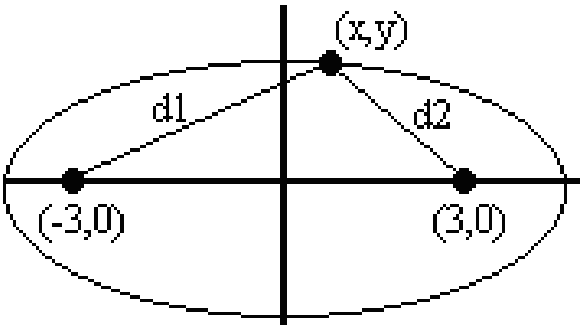
Abstract

This module provides practice problems related to developing the formula for an ellipse.



Here is the geometric definition of an ellipse. There are two points called the "foci": in this case, (-3,0) and (3,0). A point is on the ellipse if the **sum** of its distances to both foci is a certain constant: in this case, I'll use 10. Note that the foci **define** the ellipse, but are not **part of** it.

The point (x,y) represents any point on the ellipse. $d1$ is its distance from the first focus, and $d2$ to the second.

Exercise 1

Calculate the distance $d1$ (by drawing a right triangle, as always).

Exercise 2

Calculate the distance $d2$ (by drawing a right triangle, as always).

Exercise 3

Now, to create the equation for the ellipse, write an equation asserting that the **sum** of $d1$ and $d2$ equals 10.

Now simplify it. We did problems like this earlier in the year (radical equations, the "harder" variety that have two radicals). The way you do it is by isolating the square root, and then squaring both sides. In this case, there are two square roots, so you will need to go through that process twice.

Exercise 4

Rewrite your equation in #3, isolating one of the square roots.

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Exercise 5
Square both sides.

Exercise 6
Multiply out, cancel, combine, simplify. This is the big step! In the end, isolate the only remaining square root.

Exercise 7
Square both sides again.

Exercise 8
Multiply out, cancel, combine, and get it to look like the standard form for an ellipse.

Exercise 9
Now, according to the "machinery" of ellipses, what should that equation look like? Horizontal or vertical? Where should the center be? What are a, b, and c? Does all that match the picture we started with?