Supplement to Worksheet 4

Worksheet 4 is slightly ahead of the material in lecture. However, it still is a useful tool to give you an introduction to the concepts pertaining to polar coordinates. Please read through this supplement before beginning Worksheet 4.

Introduction

There is more than one way to describe a location in a coordinate system. You are all familiar with the Cartesian coordinate method.

Cartesian method: (x, y)

1. Stand on the origin.
2. First, walk x units on the x-axis.
3. Then, walk y units parallel to the y-axis.

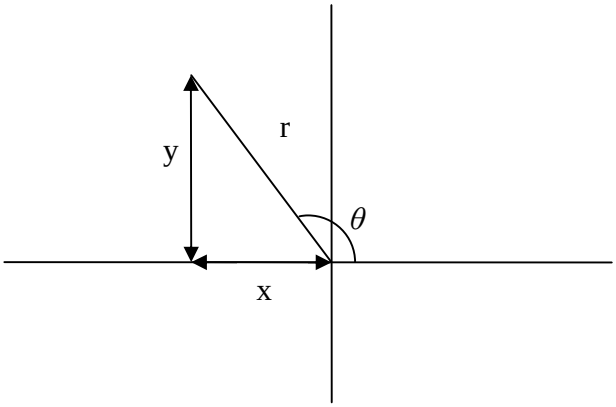
This is kind of like describing how to get somewhere by driving along streets.

However, in some scenarios it is more convenient to give the location in terms of an angle and a radius. For example, imagine you are firing a cannon (you need to know where to aim it and how powerful to shoot it). We call this the Polar coordinate method.

Polar coordinates: (r, θ)

1. Stand on the origin facing the positive x-axis.
2. Rotate counterclockwise by the angle θ.
3. Walk (or fire your cannon) a distance r in the direction you are facing.

Here is an illustration of this situation. Note that these methods both get you to the same location. We will find the polar coordinates and polar equations can greatly simplify certain problems, especially those involving circles and ellipses.



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You can go back and forth between Cartesian and polar coordinates, by using the connections given in Worksheet 4 and in the text. (These all come from basic properties of Sine, Cosine, and Tangent).

Graphing

When you first learned to graph equations such as $y = x^2$ and $y = e^x$, you had to plot points to get an idea of what the graph looked like. That is, you had to make a table by selecting values of x and computing values of y. And then you plotted (x, y) using the Cartesian coordinate method.

Since we are new to polar coordinates, you will have to use the same idea to plot polar equations. You have to make a table by selecting values of θ and computing values of r. And then you plot (r, θ) using the Polar coordinate method.

There is one other plotting option for Polar coordinates. You can first change the variables from r and θ to x and y. Then use what you know about plotting in Cartesian coordinates. In order to change the variables you will need to use the identities from Worksheet 4 and you will have to do some algebra.

Now Attempt Worksheet 4

The idea behind Worksheet 4 is to give you a chance to experiment with this new coordinate method before I start giving you all the facts. On Friday, we will lecture on Polar coordinates and fill in any gaps in your understanding.