Calculus 251:C3 Reading Guide - 6/15/2020

Review of Polar Coordinates

This reading guide is different from all of the others, because I am just going to give you textbook references to a number of topics. In theory, you should know all of this material from Math 151-152 or whatever equivalent courses you have taken to get here. Of course, if I believed that everyone knew this material thoroughly we would not be spending a lecture on it. The reason that this topic is of critical importance to us is that next Monday we will be talking about cylindrical and spherical coordinates in $\mathbb{R}^3$. None of that will make any sense if you are not thoroughly comfortable with polar coordinates in $\mathbb{R}^2$.

Textbook sections on basic concepts which you probably don't need to review, but I'm listing them just in case:

§1.4 Trigonometric Functions

§2.6 The Squeeze Theorem and Trigonometric Limits

§3.6 (Differentiation of) Trigonometric Functions

Sections that you will almost certainly want to look through:

§11.3 Polar Coordinates

§11.4 Area and Arc Length in Polar Coordinates

§11.5 Conic Sections (mostly because it will help you visualize 3 dimenstional versions in $\mathbb{R}^3$)

These are the things that you need to be able to do:

- convert points between rectangular and polar coordinates
- convert equations between rectangular and polar coordinates
- describe the graphs of a curve given its graph in polar coordinates (least important item on this list)
- compute area in polar coordinates (polar integration)
- compute the area between two curves in polar coordinates
- set up integrals for arc length of polar curves (you will only be able to compute these explicitly in special cases, as was true for arc lengths of parametrized curves in both $\mathbb{R}^2$ and $\mathbb{R}^3$).