Key Concepts and Skills needed for Math 283

Differential Calculus

Suggested Review: Work through the example problems in sections 3.1, 3.2, 3.3, 3.4 (begin with Ex 2), 3.5, 3.6, 4.1, 4.2

Note: Section 3.5 will require you to find a limit numerically (Ex 1) and sketch the graph of derivative given the graph of the original function (Ex 2). These skills and concepts are taught in section 1.8 (see 1.8, problem #27 for practice) and section 2.3 (see 2.3, Ex 1, 2 and 3 for more practice).

- Know the *limit definition* of the derivative and be able to apply it in finding the derivative of a function.
- Understand the *geometry of the limit definition* and know that the derivative of a function at a point IS the *slope of the tangent line* at that point.
- Find the *equation of the tangent line* of a function at a particular point.
- Apply the *rules of differentiation* to find the derivative of a function algebraically. Specifically, review (memorize) the Power Rule, Product and Quotient Rules, Rules, the Exponential Function Rule, the Chain Rule, and the rules for differentiating sin(x), cos(x) and tan(x), and ln(x).
- Find the *second derivative* of a function and interpret it in terms of *concavity*, and the *location of local max's and min's*.
- Apply derivatives in *optimization*, i.e. finding *local and global max's and min's* of a function.
- Interpret a derivative as a *rate of change*.

Parameterization, Vectors and Functions of Two Variables

Suggested Review: Work through the examples in sections 4.8, 12.2, 12.3 (skip Ex 7), 12.4, 13.1, 13.3, 13.4

- Given a vector in component form, be able to graph it, find its magnitude (interpret this geometrically) and convert it to a *unit vector*
- Find the *scalar product* of a vector and the *sum/difference*, the *dot product* and the *cross product* of 2 vectors and interpret geometrically
- *Graph* a function in two variables (or an equation in x, y and z).
- Construct and/or interpret *contour diagrams*
- Find the *parameterization* of a line and a circle

Integral Calculus

Suggested Review: Work through the example problems in sections 5.2, 6.2, 7.1,

- Evaluate definite integrals by using the *Fundamental Theorem of Calculus*.
- Find indefinite integrals (anti-derivatives) by using *substitution*.
- Technically, you should know the "Techniques of Integration", involving Integration by Parts (LIATE), Trig Substitution, use of Tables and the like, but a good working knowledge of just substitution will suffice for most problems that we'll do.
- Interpret a *definite integral* in terms of *area.*
- Know the *Riemann Sum* definition of a definite integral and the *geometry of Riemann Sums.*