MATH 265B FINAL EXAM CONCEPT REVIEW SHEET

You may have an 8.5 x 11 inch sheet of formulas, theorems and definitions. The formula sheet may not contain solved problems of any sort or algorithms (steps for solving problems). I'll check the sheet before the exam to okay the contents.

CHAPTER 6: Applications of Integration. You should leave this course with the ability to "slice and sum" in order to solve problems.

- Find the area between two curves (xy-coordinate system).
- Find the volume of a solid of revolution, using either the Disk (Washer) Method or the Cylindrical Shells (Bushings) Method (your choice)
- Applications: Use integration to compute work done by a spring, and to find total hydrostatic force on a plate or dam.

CHAPTER 7: Integration. You should leave this course with the ability to integrate easily and to pick a technique that is best for a given problem.

- **Integration by substitution:** Train your eye to see a function, u, and its derivative, du, in the integrand of a given integral. Try NOT to use mechanical means of doing u substitution (i.e., DON'T solve for dx and substitute that into the integral).
- **Integration by parts**: Remember LIATE as the priority for choice of u.
- **Partial Fraction Decomposition:** Break a fraction into smaller component fractions.
- **Trigonometric Integrals:** In dealing with integrand that contain sine and/or cosine functions to a power
  - If powers are ALL EVEN, use Half-Angle Identities to reduce the power.
  - If powers are odd, or mixture of even/odd, "peel off" a single sine or cosine from the odd-powered term, then use Pythagorean Identities to rewrite the other part so that you can use u-substitution to complete the problem.

- **Improper integrals**: particularly those with infinity as a limit of integration. Be able to evaluate these using proper limit notation; interpret the result in terms of area.

- **Approximation Methods:** Be able to approximate the value of a definite integral using Left Sum, Right Sum, MidPoint, Trapezoid, and/or Simpson's Rule. Know the geometry of each method (except Simpson's Rule).

CHAPTER 8: Differential Equations

- Solve an Initial Value Problem (IVP) using Separation of Variables
- Sketch the slope field for an autonomous DE. "Autonomous" means: $\frac{dy}{dt} = f(y)$ (there's no t on the right hand side) and identify equilibrium solutions. Classify them as stable or unstable.
- Identify a slope field for a given differential equation
- Sketch a solution curve to an IVP using slope fields.
- Solve an application problem by setting up and solving an IVP. (Newton's Law of Cooling!)

CHAPTER 9: Sequences and Series.

- Determine whether a series converges or diverges. Tests you should know well are Direct Comparison, the p-Series, and Geometric Series Tests. You'll apply the Ratio Test in the context of Power Series (see below).

CHAPTER 10: Power Series

- Determine the interval of convergence for Power Series using the Ratio Test approach.
- Use the Taylor Series Formula to find the Taylor Polynomial or Taylor Series for a function about x = a

CHAPTER 11: Parametric Equations and Calculus in Polar Coordinates

Parameterization

- Given a set of parametric equations, graph the curve *including orientation*; eliminate the parameter to find the xy-equation.
- Be able to find a parameterization for a general curve y = f(x), for a line, and for a circle.
- Be able to find the slope and the equation of the tangent line at a specified point. Be able to give the parametric form of the equation of the tangent line *including the phase shift.*

Polar Coordinates

- Be able to graph a polar equation (circle, lines through origin, vertical line, horizontal line)
- Convert xy-equations to polar and vice versa. Convert xy-points to polar and vice versa.
- Find the slope of the tangent line to a polar curve
- Find the area between two curves given in polar coordinates. This will include being able to find points of intersection.