Math 125, Final Exam: Main Topics for Review

Main Concepts and Methods:

- Know well the various integration techniques (and when to try them, see guidelines in §7.5):
  
  - Substitution (5.5),
  - By Parts (7.1),
  - Products of trig functions (7.2),
  - Partial Fractions (7.4) and
  - Trig Substitution (7.3)
  + Strategies for Integration (7.5)

  [Note if you cannot recognize and apply u-substitution really well, then you won’t be able to successfully do most of the other methods either.]

- Review the Fundamental Theorem of Calculus (5.3). You need to understand well the precise relationship between indefinite/definite integrals and differentiation, in both directions. Be able to recognize FTC from notation, or in the context of a problem.

- Approximating definite integrals by Midpoint, Trapezoidal or Simpson’s Rule (7.7). (First write out the integral to be approximated, if not given, then carefully apply the method.)

- Recognizing improper integrals, and using limits to compute them (7.8). Need to know how to compute limits, and show your work.

- Understand what differential equations are (9.1) and how to solve differential equations which are separable (9.1 and 9.3)

Main Applications:

- Be able to use definite integrals to compute areas and net change, or vice versa (5.1, 5.4)
- Computing areas between curves (6.1). Understand well the relationship between integrals & areas.
- Volumes of solids of revolution, know both methods and when to use each (6.2, 6.3).
- Average value of a continuous function on an interval (6.5)
- Arc length of a curve (8.1).
- Finding the x and y coordinates for the center of mass of a plate (8.3).
- Applications of differential equations: Mixing Problems, Newton’s Law of Cooling, Population Growth, etc. (9.1, 9.3, 3.8). Be able to set up the diff eqs, and to solve them; may need to identify and use an initial condition to fix the constant.

  Also:  know well all trig functions (identities, special values, etc)
  and have good algebra skills!