This document consists of a summary of the topics that may appear on Midterm 3, organized by textbook section. I have attempted to identify both which topics are important, and which topics appear in the textbook but will not be covered on the exam.

This list is meant as an aid, not necessarily a comprehensive list.

When in doubt, the gold standard for whether a topic/technique may appear on the exam is: was there an example in class (on February 13 or later), or a problem on one of Problem Sets 5-8 about the topic?

- §11.8 (Power series): The definition of "power series," and the keywords "center," "radius of convergence," and "interval of convergence." Know how to find both the radius and the interval of convergence, using the various tests from 12.2-12.6.
- §11.9: (Power series representations): know how to turn knowledge about one series representation (e.g. that of $1/(1-x)$) into knowledge about series representations of other functions. Most essential techniques:
  - Substituting terms like $-3x$, $2x^3$, or $x-1$ for x.
  - Multiplying by a power of x.
  - Adding two series together.
  - Integrating or differentiating.

  In each case, know how the operation may affect the radius of convergence.
- §11.10 (Taylor and MacLaurin series): Know how to use the definition to find a function's Taylor series. Know the terminology "Taylor polynomial" and "Taylor series." Know **very well** the Taylor series for the following six functions: $\frac{1}{1-x}, \ln x, \arctan x, e^x, \cos x, \sin x$. It is a good idea to know how each one was derived in class.
  - Know how evaluate specific series by relating them to known Taylor series (e.g. the Supplemental problems on PSet 11).
  - Know how to using power series to express integrals as sums of series.
  - Know ASET, a technique for approximating the sum of a series to a specific error bound.
- §5.2 - 5.3 (Volumes) Methods of discs/washers, and method of cylindrical shells. Know how to compute volumes of revolution around any vertical or horizontal line.
  - Try to understand visually why the integrals are set up the way that they are (e.g. understand geometrically why there is a factor of π in the washer method, but a factor of 2π in the shell method).
- §10.1 (parametric equations): know how to sketch a parametric curve (by plotting some points) with arrows to indicate direction of travel. Know how to convert a parametric equation to a Cartesian equation.
- §10.2 (calculus with parametric curves): Know how to find
  - The tangent line to a parametric curve at a particular value of t.
  - An integral for the arclength of a parametric curve from one value of t to another.

  - An intergral for the surface area of a surface given by revolving a parametric curve around the x-axis or y-axis.

In many cases, the integrals for arclength of surface area will not be tractable. In these cases, I would only ask you to write down the integral, but not evaluate it. In other cases, the integral will serve as a review of integration techniques from earlier in the course.

Some topics in the book that you don't need to know

- §11.10: Taylor's remaidner theorem (e.g Box 8 and 9 on page 780).
- §11.10: Binomial series.
- §11.11: everything except Taylor polynomials.
- §10: anything about graphic calculators, or specific names for various curves.
- §10.1: material on families of parametric curves.
- §10.2: Area for parametric equations (page 671).
- Anything from §10.3 or later (polar equations), which appears on the final exam but not this week's midterm.