This document consists of a summary of the topics that may appear on Midterm 2, 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?

- §7.3: The trig substitution $x = a\tan\theta$ (which was not covered on Midterm 1), used to deal with expressions involving $\sqrt{a^2+x^2}$.
- §7.4: Integration of rational functions by partial fractions. In this section/semester, I mainly focused on the *p*roper case, i.e. the case where the numerator has a smaller degree than the denominator (one exception: Supplement 1 on PSet 6, which can be reduced to the proper case with a relatively small amount of algebra). Also, the technique of **rationalizing substitutions,** which may turn integrals involves square roots (or nth roots) into rational functions.
- §7.5 (Integration strategy) discussed some tactics for deciding which integration techniques to try in a given situation.
- §7.8 Improper integrals. We discussed only the type of improper integrals that the book calls "Type 1." Know how to compute improper integrals by converting them into limits.
- 11.1 Sequences, and limits of sequences. Make sure you understand the difference between a "sequence" and a "series."
- 11.2 Series. Make sure you the vocabulary of "partial sums," "convergence," and "divergence." Know the basic facts about geometric series: when they converge, how to compute their partial sums, and how to compute their sums. Also know how to apply the NTDT (Nth term divergence test). Be familiar with some of the applications we discussed in class (income multiplier, build-up of medication concentration after many equally spaced doses).
- 11.3 Integral Test (IT). Make sure you know the conditions under which IT can be applied. Important example: p-series. Know at a glance the cases under which $\sum_{n=1}^{\infty} \frac{1}{n^p}$ converges. Be careful to note the difference between p-series and geometric series (despite the cosmetic similarity).
- 11.4 Comparison test: CT and LCT. Know how to select an appropriate comparison, making sure to check the requirements before invoking either test.
- 11.5 Alternating series test (AST). Know the statement of this test, and how to recognize the cases where it applies.
- 11.6 Absolute convergence test (ACT), Ratio Test (RT). Know these two tests. Know the vocabulary "absolute convergence" and "conditional convergence." The ratio test is great for series involving factorials and exponential terms. We are *not* covering the root test.

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

- §7.5: inverse hyperbolic functions.
- §7.8 Comparison test for integrals. Improper integral of "Type 2."
- §11.3-6: proofs of the various convergence tests.
- §11.3 The content about estimating sums.
- §11.4 and 11.5: the content about estimating sums and remainders.
- §11.6 The root test or rearrangements.