

Review sheet for final exam.

For the final exam, you may bring a cheat sheet. You are allowed to use **one side** of a standard $8.5'' \times 11''$ sheet of paper. Nothing should be written on the other side. Your cheat sheet must be hand written by you. No photocopies are allowed.

The best way to study for the exam is to learn how to do all of the assigned practice problems. If you run out of problems, learn to do all of the problems in the book! In addition to the practice problems assigned over the course of the semester, working through the problems in the review sections of the book would make for a useful start. Practice other practice problems too! Below are the relevant review problems to look at:

- **Chapter 6:** 1-16, 23-25
- **Chapter 7:** 1-50, 72-76
- **Chapter 11:** 1-9, 11-32, 40-54
- **Chapter 9:** 5-11
- **Chapter 10:** 1-6, 9-16, 32-42

The following is a list of the topics that I think are important:

- You should have all integrals (and derivatives) of elementary functions memorized.
- 6.1: Area between curves
 - Know how to find the area between two curves
- 6.2: Volumes
 - Know how to find the volume of a solid with specified cross-sections.
 - Know how to use the washer/disk method to find volumes of revolution.
 - Be comfortable with solids obtained by rotating about any vertical or horizontal axis.
- 6.3: Volumes by cylindrical shells
 - Know how to compute volumes of revolution using the method of cylindrical shells.
 - Know how to use cylindrical shells to compute volumes of solids obtained by rotating about any vertical or horizontal axis.

- 7.1: Integration by parts
 - Be an expert of integration by parts.
- 7.2: Trigonometric integrals
 - Know the various “straightforward” rules: odd power of \sin or \cos , what to do if there are only even powers of \sin/\cos , even powers of \sec , odd power of \tan , etc. . .
 - Be comfortable with dealing with integrals that don’t fit exactly into one of the above rules.
- 7.3: Trigonometric substitution
 - Have the table for trig substitutions memorized.
 - Practice many types of trig substitution problems.
- 7.4: Partial fractions
 - Know the full recipe for partial fractions.
 - Know how to integrate the result of a partial fraction calculation.
 - Practice many types of partial fractions problems.
- 7.5: Strategy for integration
 - Practice integrals. You should be able to do integrals without knowing from what section they came. After solving an integral, ask yourself if there was a simpler or more complicated way to do it.
- 7.8: Improper integrals
 - Know the comparison theorem for improper integrals.
 - Be able to apply the above to test improper integrals for convergence or divergence.
- 11.1: Sequences
 - Know how to decide if a sequence converges or not.
 - Don’t confuse sequences and series.
 - Know the limit laws, the squeeze theorem, and the theorem that says that if the limit of the absolute value is zero, then the limit of the original sequence is zero.
 - Know the monotonic sequence theorem.

- 11.2: Series
 - Know the definition of a series and how to decide if it converges or not by looking at the sequence of partial sums.
 - Be able to identify geometric series.
 - Know how to either compute the value of a geometric series or show that it diverges.
 - Know the test for divergence. Know not to apply it backwards (limit of terms equals zero **does not imply** that the sequence converges).
 - Be able to identify and test telescopic series for convergence.
- 11.3: Integral test
 - Know how to use the integral test to decide convergence.
 - Be sure to know how to check that the hypotheses are satisfied.
 - Know how to tell if a p -series is convergent.
- 11.4: Comparison tests
 - Be an expert at using the comparison and limit comparison tests.
- 11.5: Alternating series
 - Be able to identify alternating series.
 - Know how to use the alternating series test.
- 11.6
 - Know the definitions of absolutely and conditionally convergent and how to test series for these types of convergence.
 - Be able to use the ratio test.
 - Be able to use the root test.
- 11.7: Strategy for testing series
 - Practice!
- 11.8: Power series
 - Know the definition of a power series centered at $x = a$.
 - Be able to compute the radius of convergence and interval of convergence for a power series. Don't forget about the endpoints!

- 11.9: Representing functions as power series
 - Know the power series expansion for $1/(1 - x)$ on $(-1, 1)$.
 - Be able to manipulate this series to find power series representations of related functions and their radii and intervals of convergence.
 - Know the theorem about integrating and differentiating power series representations of functions.
- 11.10: Taylor and Maclaurin Series
 - Know how to find a Maclaurin or Taylor series for a given function.
 - Know how to use a given series to find related series via substitution, integration, and differentiation.
- 9.1: Differential equations
 - Know what a differential equation is and what it means for a function to be a solution.
 - Understand what an initial value problem is.
- 9.3: Separable equations
 - Know how to identify and solve separable differential equations.
 - Be able to solve mixing problems.
- 9.5: Linear differential equations
 - Know how to solve first-order linear differential equations and initial value problems.
- 10.1: Parametric equations
 - Understand parametric equations.
 - Know how to parameterize basic curves.
 - Be able to use parameter elimination to identify parametric curves.
- 10.2: Calculus of parametric curves
 - Know how to compute the area under a parametric curve.
 - Be able to compute the arc length of a parametric curve.
 - Know how to compute the surface area of a surface of revolution coming from a parametric curve.

- 10.3: Polar coordinates
 - Understand how to describe points in the plane with polar coordinates and be able to convert to and from Cartesian coordinates.
 - Be able to graph polar curves.
- 10.4: Areas and lengths in polar coordinates
 - Know how to compute the area of polar regions.
 - Be able to compute lengths in polar coordinates.