Topics for Final Exam
Math 31, Spring 2010

The final exam will be a timed test of 2 hours and 15 minutes (Tue May 25, 9:45am–noon). You are allowed to use a calculator and notes on **ONE** 3×5 note card (both sides).

The final exam will be comprehensive, and will therefore involve both the topics on this sheet and **all previous topics**. There will be some emphasis on the topics listed here, but everything we have covered is fair game.

Your first priority should be to understand the homework and the principles behind it. Besides the list below, you should also be familiar with everything specially emphasized in the text (i.e., the red boxes), and all the examples in the text. If time permits, try to do the example problems in the text by yourself. If you can do all of the homework assigned this semester, and you know and understand all of the ideas behind it, you should be in good shape.

Section 11.6. Definitions: absolutely convergent, conditionally convergent. Absolute convergence implies convergence. Key example: alternating harmonic vs. harmonic series. **The Ratio Test**. Examples of using the Ratio Test.

Section 11.7. How to determine convergence/divergence of a random series: What does it look like? Then try: p-series, geometric series, comparison/limit comparison, nth term test for divergence, Alternating Series Test, Ratio Test, Integral Test.

Section 11.8. Definitions: power series, coefficients, power series centered at a, radius of convergence, interval of convergence. Computing the radius of convergence (Ratio Test); testing the endpoints to get interval of convergence.

Section 11.9. Known power series: $\dfrac{1}{1-x} = \displaystyle\sum_{n=0}^{\infty} x^n$ for $-1 < x < 1$. Obtaining new power series from old: Term-by-term differentiation, term-by-term integration, adding power series, multiplying by x^k. For all: Radius of convergence is preserved, though not necessariliy convergence at endpoints.

Section 11.10. Definitions: Taylor series of $f(x)$ centered at a, Maclaurin series of $f(x)$. Computing coefficients of a Maclaurin series or Taylor series. Examples of Maclaurin series and where they are equal to their functions: $\dfrac{1}{1-x}$, e^x, $\sin x$, $\cos x$, $\arctan x$. Using Taylor series to approximate values, do impossible integrals, approximate impossible integrals.

Appendix H. Definitions: i, complex number, imaginary part, real part. How to add, subtract, multiply, divide complex numbers. Complex conjugation: algebraic properties, picture. Modulus/absolute value, argument; multiplication, division, and taking powers in terms of modulus and argument. Complex exponentials.

Not on exam. (11.6) The Root Test; rearrangements. (11.8) Bessel functions. (11.10) Remainder $R_n(x)$, Taylor's Inequality, multiplication and division of power series. (App. H) Roots of a complex number (formula, picture).