Math 135 Final Review

Final Exam Topics

Sequences and series

- 1. Indeterminate forms, L'Hospital's rule, improper integrals.
- 2. Sequences: Basic definitions and theorems about convergence, important limits, fixed points of contractions.
- 3. Series: Basic definitions, important series (geometric, harmonic, *p*-series), convergence tests (comparison, integral, root, ratio, alternating series), Taylor series and power series, radius of convergence, interval of convergence, important examples (like e^x , $\sin x$, $\cos x$, $\ln x$), differentiation and integration of series

Differential equations.

- 1. $f_n(t)y^n + ... + f_1(t)y' + f_0(t)y = g(t)$: Linear independence, form of the general solution in both the homogeneous and non homogeneous cases.
- 2. $a_n y^n + ... + a_1 y' + a_0 y = 0$: (a_n constant) Solution using the characteristic equation.
- 3. $a_n y^n + ... + a_1 y' + a_0 y = f(t)$: (a_n constant) Method of undetermined coefficients, Laplace Transforms, variation of parameters.
- 4. y'' + p(t)y' + q(t)y = g(t): Reduction of order (variation of parameters).
- 5. Existence and Uniqueness Theorems for ODEs that we have proved: first order; higher order linear with continuous coefficients; higher order linear with analytic coefficients.
- 6. Existence and Uniqueness of Laplace transforms (for piecewise continuous, exponential type). See web page for the Laplace transform page that will be included on the final exam.

3D Space, Vectors and Vector Calculus

- 1. Vectors, dot and cross products, orthogonal and parallel vectors.
- 2. Equations of lines and planes in space. Using vectors to calculate distances between points, lines, planes.
- 3. Definitions and computations of limits, derivatives and integrals of vector functions.
- 4. Curves: Intersecting curves in space, tangent lines to curves, **T**, **N** and **B** vectors, normal and osculating planes, arc length, curvature.