Math 2300
Final Exam topics

The exam is cumulative, so the following is a compiled list of ideas we have discussed in class. You may also want to visit the course website to look over the schedule of concepts and review material for previous exams. The sections covered were 1.7, 3.4, 5.5–10, 6.1–6, 7.1–5, 8.1–7, H.1–2.

- Integration techniques, including:
  - u-substitution
  - Integration by parts
  - Trig Integrals
  - Trig substitution
  - Partial fractions
- Numerical integration techniques
  - Midpoint Rule
  - Trapezoidal Rule
  - Simpson's Rule
  - Estimating Error for numerical integration
- Evaluating improper integrals
- Area between curves
- Volumes of solids of revolutions (disc and shell methods)
- Volumes of solids by slicing (using areas of known cross-sections)
- Application of integrals
  - Calculating work
  - Finding centers of mass and calculating moments
- Sequences
  - Recall what are sequences, when do they converge or diverge, and where we applied the idea of sequences.

- Series
  - Recall what are series and when do they converge or diverge.
  - Recall the different tests we have to determine if series converge or diverge. Be sure to know the hypotheses (conditions) necessary to apply each test, and be able to verify the hypotheses.
    * Divergence test
    * Direct comparison test (or term comparison test)
    * Limit comparison test
    * Integral test
    * Geometric series (be able to calculate the value of the sum of the series)
    * Telescoping series (be able to calculate the value of the sum of the series)
    * Alternating series test
    * p-series test
    * Ratio test
- Estimate the sum of a series
  - Remainder Estimate for the Integral Test
  - Alternating Series Estimation Theorem
  - Taylor's Inequality
- Determine the radius and interval of convergence for a power series.
- Representing functions with power series
  - Be sure to know series representations for functions such as: e^x, $\sin x$, $\cos x$, $\frac{1}{1-x}$, $\ln(1+x)$, and $\arctan x$.
  - Know how to find the sum of a power series, by recognizing it as a transformation of a known series.
- Taylor series
  - Be sure to know how to find the Taylor series representation for a function.
  - Recall what Taylor series approximations tell us about a function's behavior.
  - Know what the Taylor polynomial remainder estimate represents.
- Differential equations
  - Write a differential equation to model a physical situation described
  - Set up differential equation for situations such as growth/decay, logistic equation, flow in/flow out.
  - Solve separable differential equations.
  - Interpret or create the directional field (slope field) for a differential equation.
  - Use Euler's method to approximate function behavior.
- Arc length (finding length of a curve between two points)
- Calculating the average value of a function

- Parametric equations
  - Find the slope and concavity of a parametric curve.
  - Find tangent lines to parametric curve.
  - Sketch a parametric curve.
  - Find the length of a parametric curve.
- Polar coordinates
  - Sketch a polar curve.
  - Find tangent lines to polar curves.
  - Find the length of a polar curve.
  - Find the area within a polar curve or between two polar curves.