Calculus 2 (*Math 120, Math 128**) Common Topics List[1]

1. **Integration**
   (a) antiderivatives
   (b) Riemann Sums
      i. definition of definite integral
      ii. area problem
   (c) Numerical Integration
      i. left, right, midpoint
      ii. over estimation or under estimation
   (d) Fundamental Theorem of Calculus
   (e) Techniques of Integration
      i. u-substitution
      ii. integration by parts
   (f) Applications
      i. area between curves
      ii. specific problems that lead to an integral via Riemann sums (e.g. work, average of a function, ...)
   (g) Improper Integrals*
   (h) L'Hopital's Rule*
2. **Sequences and Series***
   (a) sequences
      i. definition/idea
      ii. convergence/limit
   (b) Special Series
      i. geometric
      ii. harmonic
      iii. alternating
      iv. p-series

[1]This list was drafted at the 9/14/09 Math Departmental meeting and approved at the 9/28/09 meeting. Items marked with an asterisk will be taught in Math 128. This excludes most aspects of Integration exscept those that involve infinity.

(c) Series Convergence Tests

i. integral
ii. p-series
iii. alternating series
iv. comparison **or** limit comparison
v. ratio **or** root

3. **Taylor Polynomials***

(a) an application of Taylor Polynomials (e.g. approximate a definite integral, a limit)

4. **Taylor Series***

(a) Taylor series usually converge to the original function (note the counterexample: $f(x) = e^{-\frac{1}{x^2}}$ for $x \neq 0$, $f(x) = 0$ for $x = 0$).
(b) power series define (possibly non-elementary) functions
(c) know the Taylor series for e^x, $\frac{1}{1-x}$, $\sin x$, $\cos x$

5. **Power Series***

(a) operations on series (differentiation, integration, ...)
(b) radius and interval of convergence

Examples of Additional Topics

- More numerical techniques of integration: trapezoidal rule, Simpson's rule
- Fourier Series
- Laplace Transforms
- Optimization of 2-D functions