Calculus 1 Common Topics List\(^1\)

1. Functions
   (a) polynomials, rationals, exponentials, logarithmic, trigonometric, arctan, absolute value, radicals, power function
      i. graphs
      ii. continuity properties
   (b) inverse functions
   (c) composition of functions
   (d) functional notation
   (e) functions of two variables, i.e. \(f(x, y)\)

2. Limits
   (a) intuitive definition
      i. graph
      ii. table
   (b) right- and left-hand limits
   (c) analytical procedures for computing limits
   (d) limit laws (properties of limits)
   (e) indeterminate forms \(\frac{\infty}{\infty}\) and \(\frac{0}{0}\)
   (f) successive approximations (judging accuracy subjectively through iterations, i.e. two approximations of the same result are better than one)

3. Continuity
   (a) intuitive/graphical understanding
   (b) list of functions that are continuous on their domains
   (c) recognizing discontinuities in a function given by a formula
   (d) definition of continuity ("limit" definition)

\(^1\)This list was approved at the 8/28/09 Math Departmental retreat
4. **Derivative**

   (a) interpretation  
      i. rate of change  
      ii. slope of tangent line  
   (b) derivative as a function  
   (c) limit definition of derivative  
   (d) computing derivatives  
      i. rules (sum, product, quotient, chain rule)  
      ii. derivatives of functions listed under Continuity and Functions sections  
   (e) max-min (single variable optimization), including word problems  
   (f) higher order derivatives  
   (g) velocity and acceleration  
   (h) using the derivative to understand properties of graphs  
   (i) local linearity (estimating a function with its tangent line)  
   (j) implicit differentiation (differentiation of an implicitly-defined function)  
   (k) introduction to partial differentiation, i.e. differentiation of functions of two inputs

5. **Technology**

   (a) exposure to Excel  
   (b) familiarity with a graphing calculator

6. **Differential Equations**

   (a) Is a given function a solution to a DE?  
   (b) DE’s model the real world applications
Examples of additional Topics

- Newton’s Method
- L’Hôpital’s Rule
- Euler’s Method
- Related rates