

# Calculus 1 Common Topics List<sup>1</sup>

## 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)

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<sup>1</sup>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