Math 229 - Calculus I - Concepts List

I. **Limits, Continuity, and Theorems**
   (a) Estimate limits from graphs and tables (one and two sided)
   (b) Calculate limits algebraically by
      a. limit laws
      b. factoring
      c. common denominators
      d. conjugates
   (c) Infinite Limits - asymptotic behavior
   (d) The precise definition of a limit
   (e) Determine the continuity of a function graphically
   (f) Determine the continuity of a function algebraically
   (g) Sketch a graph of a function using basic information about limits and continuity
   (h) What is the Intermediate Value Theorem? What's its purpose?

II. **Derivatives**
   (a) Rates of Change and Secant Lines
   (b) Find a derivative by using slopes of secant lines
   (c) Limit Definition of a Derivative
   (d) Sketch the graph of a derivative
   (e) Find a derivative using the power rule
   (f) Find a derivative using the product rule
   (g) Find a derivative using the quotient rule
   (h) Find a derivative using the chain rule
   (i) Find a derivative of trigonometric functions
   (j) Find a derivative using multiple rules
   (k) Find a derivative using implicit differentiation

III. **Applications of Derivatives**
   (a) Find the equation of a tangent line to a curve
   (b) Solve problems relating to velocity and acceleration
   (c) Solve related rates problems using implicit differentiation
   (d) Solve optimization problems using the derivative
   (e) Use the derivative to determine increasing and decreasing intervals
   (f) Use the derivative to identify local max and mins
   (g) Extreme Value Theorem
   (h) Use the first derivative to find extreme values
   (i) Use the second derivative to determine concavity and points of inflection
   (j) Sketch the graph of a function using the first and second derivatives
   (k) Find an approximate function value using the tangent line (Linearization) or differentials
   (l) Correctly applying Newton's Method

IV. **Integrals**
   (a) Use left, right, and midpoint Riemann sums to approximate area
   (b) Evaluating definite integrals by using limit of a Riemann Sum
   (c) The Fundamental Theorem of Calculus Part 1
   (d) The Fundamental Theorem of Calculus Part 2
   (e) Antiderivatives and Indefinite Integrals
   (f) Use substitution to evaluate an integral (definite and indefinite)