

Calculus I (Math 110, Math 114) Topics List ¹

(*) means that this topic should be included in Math 114.

- (h) Infinite limits and limits at infinity; Vertical and horizontal asymptotes, removable singularities.
- (i) Definition of continuity at a point.
- (j) Permanence of continuity; linear combinations, products, quotients, composition.
- (k) Continuity on a domain.
- (l) Left and right continuity; continuity on a closed and bounded interval.
- (m) The Intermediate Value Theorem with examples.

2. The Derivative

- (a) The geometric intuition of a tangent line.
- (b) Differentiability at a point.
- (c) Differentiability on an interval.
- (d) Finding the equation of a tangent line to a graph at a point.
- (e) Parametric equations and their derivatives.
- (f) Implicitly defined curves and Implicit Differentiation.
- (g) Rules of differentiation; linear rule, power rule (proof*), product rule (proof*), quotient rule, chain rule.
- (h) Higher order derivatives.
- (i) The Inverse Function Theorem; (**)
- (j) Relation between derivatives of inverse function pairs.
- (k) Derivatives of exponential, logarithm, inverse trig functions.
- (l) Derivatives of hyperbolic functions. (*)
- (m) Logarithmic differentiation.
- (n) Rolle's Theorem and The Mean Value Theorem with examples. (*)
- (o) Relative and absolute extrema. Fermat's theorem, critical numbers. First and second derivative tests. Concavity. Inflection points.
- (p) The Extreme Value Theorem with examples.

3. Applications of Differentiation

- (a) Indeterminate forms (l'Hopital's rule).
- (b) Limit definition of e^a . (**)
- (c) Curve sketching.
- (d) Optimization.

