
A List of Topics for the Second Midterm

Here's what you should be able to do for the second midterm.

Old stuff.

1. Limit rules

- (a) Calculate limits using basic properties: if you know the limits of two expressions, can you find the limits of their sum, product, etc.?
- (b) Compute more difficult limits using cancellation, multiplication by the conjugate, and other algebraic tricks.
- (c) Recognize when limits tend to infinity or do not exist.
- (d) Do all of the above when x tends to ∞ or $-\infty$ rather than some real number a .

2. Basic derivatives

- (a) Understand the relationship between derivatives and limits, and compute basic derivatives by evaluating limits.
- (b) Compute limits of monomials (via the power rule), e^x , and trigonometric functions.
- (c) Use the product rule and quotient rule to find derivatives of functions that are products and quotients of other functions.
- (d) Find the equation for a tangent line to a function at a certain point.

New stuff.

3. Advanced derivatives

- (a) Compute the derivatives of exponential, inverse trigonometric, and logarithmic functions.
- (b) Use the chain rule to find the derivatives of compositions of functions.
- (c) Use logarithmic differentiation to differentiate functions of the form $f(x) = g(x)^{h(x)}$.

4. Calculus with parametric equations

- (a) Find the equation for a tangent line to a parametric curve at a given point in time, or at a given point on the curve.
- (b) Determine when a particle is moving horizontally, or vertically, or not moving at all, by examining the derivatives of its parametric equations.
- (c) Calculate the speed of an object based on its parametric equations.

5. Implicit differentiation

- (a) Compute y' , y'' , y''' , etc. when x and y are related by an implicit equation.
- (b) Find the equation for the tangent line to a given point on a curve.
- (c) Find all points on a curve whose tangent line is horizontal or vertical.

(d) Find the equation for a tangent line to a given curve that passes through a given point **not** on that curve.

6. Related rates

(a) Solve related rates problems. Sorry if you were expecting something really deep.

7. Linear approximation

(a) Find the linear approximation to a function around a certain point.

(b) Use linear approximation to estimate values of functions that would otherwise be difficult without the aid of technology.

(c) Use linear approximation and implicit differentiation to estimate solutions to an implicit equation that would otherwise be difficult or impossible to solve algebraically.

8. Minimum and maximum values

(a) Calculate the absolute minimum and maximum values of a function on a closed interval.