

WPR I Topics

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1. Rates of Change

- Know how to calculate average rates of change and estimate instantaneous rates of change when given a function (this includes when given a formula for the function, or a table of function values).
- How are rates of change related to secant and tangent lines?
- If f represents the position or displacement of an object, then what is the rate of change of f with respect to time called?

2. Limits (of sequences and functions)

- Understand what it means for a sequence to converge to a limit.
- Understand what it means for a sequence to diverge (including the special cases of infinite behavior).
- Know how to find the limit of a sequence a_n as $n \rightarrow \infty$. This includes by looking at a plot of the terms, a table of values, or algebraically by hand.
- Be familiar with limit notation, for sequences and for functions.
- Understand what it means to talk about the limit of a function from the right or left of a point. Know how to find these one sided limits by looking at a graph of the function or a table of function values.
- Know what is required of the left and right limits in order for a limit to exist.
- Be able to compute some limits algebraically, by using factoring, expanding, or other algebra to make cancellations and simplify.
- Be able to approximate a limit by doing a numerical test on nearby points.
- Be familiar with the concepts of infinite limits and vertical asymptotes.

3. Continuity and the Derivative

- Know what it means for a function to be continuous, using the definition of continuity. Apply this knowledge to either a point or an interval.
- Know how to identify whether a function is continuous using a graph of the function *or* an algebraic expression for the function.
- What are the three types of discontinuity and what do they look like?
- What does the Intermediate Value Theorem say and how can it be applied?
- What is the *geometric* idea behind the definition of the derivative at a point?
- Know the limit definition of a the derivative at a point (we saw two of these) and how to use it to compute $f'(a)$.
- Know the limit definition of the derivative *function* and how to use it to compute derivatives.
- What information about the function f does the derivative function f' capture?
- How does the derivative relate to average and instantaneous rates of change?

- Know how to find the equation of a tangent line at a point.
- What are the three ways a function can fail to be differentiable, and what do they look like?
- Be comfortable with two notations for the derivative: $f'(x)$ and $\frac{df}{dx}$.

4. Computing Derivatives (i.e. Rules)

- Power rule
- Derivative of e^x
- Derivative of $\ln x$
- Derivative of a constant
- Derivative of a constant multiple of functions you know how to differentiate
- Derivatives of trig functions (see table on page 193)
- Product rule
- Quotient rule
- Chain rule