

Exam I covers 8.1-8.3. You should know/understand all of the following:

- How to approximate limits graphically
- Know the limit laws from p531
- That limits can be always be calculated algebraically by direct substitution if the function is continuous (e.g.  $\lim_{x \rightarrow 5} [3x + 2]$ )
- How to rewrite/simplify a function so that direct substitution may be used even though the original expression is not defined at the limit point (e.g.  $\lim_{x \rightarrow 13} \frac{x^2 - 169}{x - 13}$ )
- Which functions can possibly not be continuous (functions defined piecewise and functions such as  $\frac{|x-3|}{x-3}$ )
- That all functions not listed above that you will see in this class are continuous wherever they are defined (including polynomials, rational functions, root functions, exponential functions, logarithms, and combinations of these)
- How to determine where a function is continuous for either of the above categories of functions (check one-sided limits for breakpoints of piecewise functions; just find the domain for functions that are continuous wherever they are defined).
- The definition of the derivative
- How to determine a derivative algebraically from the definition
- How to use derivatives to find formulas for tangent lines
- How to write a sentence interpreting the meaning of the derivative as an instantaneous rate of change, including units
- Know that when a word problem asks for an instantaneous rate of change, you need to calculate the derivative
- How to interpret the derivative in terms of marginal increase, including marginal revenue/cost/profit
- How to interpret the sign of the derivative graphically in terms of the increasing/decreasing behavior of the function
- Know the following differentiation rules:
  - The constant rule
  - The constant multiple rule (make sure you understand when to apply this versus the previous)
  - The rule for linear functions
  - The power rule
  - The sum rule
  - The difference rule
- How to rewrite certain types of functions involving products and quotients so that one of the above rules applies