

**MATH 2250, Fall 2015**  
**LECTURE FOR TUESDAY 9-1-2015**

INSTRUCTOR: DANNY KRASHEN

1. (15 minutes?) The derivative as a function (Section 3.2) [The students have already seen Theorem 1, page 125 \(differentiability implies continuity\), and have seen and worked with some examples of calculating derivatives using the definition.](#)
  - i. reminder of the definition of the derivative  $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ .
  - ii. Example (from the definition):  $f(x) = x^2 + 5x$
2. (40 minutes?) Differentiation Rules (Section 3.3)
  - i. Derivative of a constant, Power rule, Constant multiple rule, Sum rule. Prove one of these using the definition, but not more (sum rule?).
  - ii. Give examples of derivatives of polynomial functions  
(like  $f(x) = 2x^4 - 3x^2 + 9x - 7$ ), and using power rule for fractional and negative exponents  
(for example,  $f(x) = \sqrt{x} = x^{1/2}$ , and  $f(x) = 1/x = x^{-1}$ ).
  - iii. Make sure to ask for questions here!
  - iv. Product rule and Quotient rule, examples  
(like  $f(x) = (x^2 - 3x + 1)(x^4 - 4x + 6)$ , and  $f(x) = \frac{x^2 - 1}{x^3 + 1}$ )
3. (20 minutes?) Group work.

With the time remaining (if any), tell the students to break up into groups and work on some practice problems like these (write them on the board, students know well how to break up into groups of about 2-4 students each and work on problems).

  - i.  $f(x) = -x^2 + 3$
  - ii.  $f(x) = 2x^7 - 3/x^3$
  - iii.  $f(x) = (x^2 + 1)(x + 7 - \sqrt{x})$
  - iv.  $f(x) = \frac{\sqrt{x}+1}{\sqrt{x}-1}$
  - v. (if they finish the others...)  $f(x) = \left( \frac{\sqrt[3]{x} + 1}{x^6 - 1} \right) \left( 1/x - \frac{4+x}{1-x} \right)$