

## Honors 125

### Homework 5, Early Derivatives

Due no later than 1:00pm Friday November 13, 2009

(May be turned in to my office or the Math Department Office, ST 1, rm 203)

Please show all work neatly. Be sure to answer all questions, showing all steps of your reasoning.

1. Let  $f(x) = -3x^2 + 2x$ .
  - a. Find the average rate of change of  $f(x)$  over the interval  $[1, 1+h]$  for each of the following values of  $h$ :  $h = 1, 0.1, 0.01, 0.001, -1, -0.1, -0.01, \text{ and } -0.001$ .
  - b. From your answer to part a, what is your estimate of the instantaneous rate of change of  $f(x)$  at  $x = 1$ ? (That is, what is your estimate of  $f'(1)$ )?
  - c. Find  $f'(1)$  using the limit definition of the **derivative at a point** (see page 226). How does that answer compare to your answer to part b above?
  - d. Find the **derivative function**  $f'(x)$  using the limit definition of the derivative function (see page 235).
  - e. Using your answer to part d, find  $f'(1)$ . How does that compare to your answer to parts b and c? How should it compare?
2. Section 3.6, Problem 44. Compute the derivative algebraically (using the limit definition of the derivative). Show all work!
3. Section 3.7, #18, 28, 32, 36, 38, 58 (for Problem 58, find the equation of the tangent line, not just the slope of the tangent line).
4. Find the equation of the tangent line to the graph of the function  $f(x) = x^2 - 4$  at the point with  $x$ -coordinate  $x = 1$ . Carefully graph both the function  $f(x)$  and the tangent line you found on the same graph.
5. Section 3.7, #96, 100