Math 1, Fall 2003
Goals for Week 3: October 6-10, 2003

Positive Power Functions: You should know what a positive power function is. You should be familiar with the shape of the graph of positive power functions: in particular, you should know

- the shape of the graph of a positive power function $f(x) = x^n$ when n is even verses when n is odd.
- the behavior of all positive power functions at $x = 0$ and $x = 1$.
- how the graphs of positive power functions compare when x is between 0 and 1.
- how the graphs of positive power functions compare when $x > 1$.

Derivatives of Positive Power Functions: You should be able to differentiate $f(x) = x^n$ at any point. You should be able to relate the formula for the derivative of a positive power function to the formulas for the derivatives of linear, quadratic, and cubic functions (in other words, you should be aware that they do not contradict each other).

Even and Odd Functions: You should know what an even function is and what an odd function is. You should know the main characteristics of the graphs of even and odd functions. Given the graph of a function, you should be able to tell whether the function is even, odd, or neither.

The Derivative as a Function and Higher Derivatives: You should be comfortable thinking about the derivative as a function as opposed to the derivative of a function at a point. You should now be able to find the derivatives of constant, linear, quadratic, cubic, and positive power functions. You should be familiar with the notion and of and notation for higher derivatives.

Sketching the Graphs of Derivatives: Given the graph of a nice function, you should be able to sketch the graph of the derivative of that function. Specifically, you should know how to sketch the derivatives of constant and linear functions. For other functions, you should be able to locate the critical points of the function and know that the graph of the derivative touches the x-axis at critical points. You should be able to find the inflection points of the function, and be able to recognize where the function is concave up verses concave down. You should be able to estimate the derivative of the original function at the inflection points (given a scale on the axes), and you should be able to find points through which the derivative function will pass corresponding to the inflection points. You should know that inflection points are the local maxima and local minima of the derivative function. Given all of this information, you should be able to draw a reasonably accurate sketch of the derivative of the function.

A Few Rules of Differentiation: You should be familiar with the sum, difference, and constant multiple rules. Given two functions $f(x)$ and $g(x)$ with derivatives, you should be able to verify the sum and difference rules for $f(x) + g(x)$ and $f(x) - g(x)$. Given a function $f(x)$ with a derivative and a real number c, you should be able to verify that the constant multiple rule for $cf(x)$. You should be able to apply the sum, difference, and constant multiple rules given two functions or a function and a constant.

Differentiating Polynomials You should know what a polynomial is. You should be able to apply the sum, difference, and constant multiple rules to find the derivative of any polynomial.

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Lecture Notes for Week 3: Lectures 5, Lecture 6, and Lecture 7

Homework for Week 3: Homework 5 and Homework 6