Preparing for Class 27

Reading: Review H-H, Section 2.5, read Section 5.1
Problems: H-H Section 2.5, #1, 4, 5, 10, 11, 13, 16

**Homework Due:** Only problems assigned to prepare for Class 27 are due at the start of Class 27.

Monday, October 30

*Class 27:*

**Maxima, Minima and Inflection Points**

The first and second derivatives can be used to identify points where a differentiable function achieves a local maximum, a local minimum, or passes through an inflection point. One way to see this is to approximate a function near a point using its second-degree or third-degree Taylor polynomial about that point. These observations are useful in graphing and also in optimization problems.

Preparing for Class 28

Reading: H-H, Appendix E (pp. 600-603)
Problems: H-H Section 5.1, #1, 5, 6, 7, 9, 15, 13

*Also solve:* Suppose \(q(x) = c_0 + c_1(x-a) + c_2(x-a)^2 + c_3(x-a)^3\). Let \(f\) be a function for which \(f(a), f'(a), f''(a)\) and \(f^{(3)}(a)\) exist. Suppose \(q(a) = f(a), q'(a) = f'(a), q''(a) = f''(a)\) and \(q^{(3)}(a) = f^{(3)}(a)\). Find formulas for \(c_0, c_1, c_2\) and \(c_3\) in terms of \(f(a), f'(a), f''(a)\) and \(f^{(3)}(a)\).

Wednesday, November 1

*Class 28:*

**Finding Roots**

A value \(r\) is a root of a function \(g(x)\) if \(g(r) = 0\). Root-finding problems often arise in using derivatives to find critical points (candidates for maxima and minima). Sometimes one can find roots through factoring. Often, however, it is necessary to approximate a root numerically. Newton’s Method for approximating roots has many advantages. It is based on the Microscope Approximation, \(\Delta y \approx f'(x) \Delta x\), using known values for \(\Delta y\) and \(f'(x)\) to estimate the \(\Delta x\) needed to improve the current estimate \(x\) of a root.

**Take-Home Quiz on Maxima, Minima and Inflection Points**

**Lab:** Newton’s Method for Approximating Roots
Preparing for Class 29

Reading: H-H, Sections 5.3; start reading Section 5.5.

Problems: Section 5.1, # 22, 33, 34; H-H p.603 # 1, 2, 5, 9

Friday, November 3

Class 29:

Optimization Problems

We have all the tools in place now to handle interesting optimization problems involving functions of one variable. Today’s class will look at a number of these.

Take-Home Quiz Due at the Start of Class