Class 21: *Monday, October 24*

L'Hôpital's Rule and Indeterminate Limits

Reading: *Smith & Minton* Section 1.4, pp. 247-249

How do limits as $x \to \infty$ differ from those where x approaches a finite value? What if you want to evaluate a limit and end up with the form $\frac{0}{0}$ or $\frac{\infty}{\infty}$? You have already seen linear approximation; however, we have not used it to help us with indeterminate limits. Today we will see how linear approximation can help us determine certain limiting values.

Homework 8: *Smith & Minton* Section 1.4: 18, 26; Section 3.1: 4, 42, 48, 50.

Exam 2: *Tuesday, October 25*

This exam will be on material covered in Classes 11 through 21. Basically, Limits and Rules of Differentiation as well some applications to functions and their inverses, compositions of functions and related rates. The exam will be in Fowler 302 and Fowler 301. There will be no calculators allowed but you can bring in one sheet of "blue notes."

Class 22: *Wednesday, October 26*

Limits for Special Indeterminate Forms

Reading: *Smith & Minton*, Section 7.6.

There are various techniques for handling indeterminate forms like $0 \cdot \infty$, $\infty - \infty$, ∞^0,1^∞, or 0^0. By in large, these are algebraic techniques which recast the problem in a form to which L'Hôpital's Rule can be applied.

Homework 8: *Smith & Minton* Section 7.6: 16, 34, 42, 44, 48.

Class 23: *Friday, October 28*

Population Models

Reading: *Hughes-Hallett*, p.510 and pp.530-533.

We will now apply our understanding of derivatives to gain new insight into initial value problems. The simplest model, appropriate for a population growing without significant competition or resource limitations, is the *exponential* model. By looking at data, we will see that this actually applied to the population of the United States in the first hundred years of its existence. As a population increases, it often begins to encounter limitations in the resources which support it. The per capita growth rate will generally no longer be constant. The exponential model can be modified to incorporate the effect of these resource limitations. The resulting *logistic* model often describes the growth of real populations well.

Homework 9: *Hughes-Hallett* Section 10.7: 2, 6, 7, 13, 19.

Homework 8 due in the Math 114 Course Box by 5:00 pm Friday October 28