MA 271 Calculus with Applications — Winter 2009

Cheryl Peterson
NSF 1115
227-1609
cpeterso@nmu.edu

Office hours: 2:00, on class days

By appointment: 11:30, 4:00 (other times possible)

Class Days

Class will meet 12:00-12:50, Monday, Tuesday, Wednesday, Thursday.

Class Website

Assignments, data sets, and other information pertaining to the course will often be posted on the class website, *http://mathlab.nmu.edu/~cpeterso/* or *http://mathlab.nmu.edu* (then select Cheryl Peterson's Page).

Prerequisites

Finite Mathematics (MA103); or College Algebra (MA104 or MA105); or equivalent.

Textbook

Applied Calculus, Hughes-Hallett, 3rd Edition, Wiley, 2006.

Computers & Calculators

We will be using laptop computers in this course. At times, you may be able to use a graphing calculator. We will frequently be working on problems in class – so you will need to have either a laptop computer or suitable calculator with you.

The university supplies the following software for University-owned computers.

- TI-Interactive (needs to be installed)
- Excel spreadsheet (already on the computer)

If you will be using a non-university-owned computer, check with me about what software you will need. (You will probably want to have TI-Interactive and a spreadsheet.)

"See-through" Ruler

A "see-through" ruler is convenient for reading graphs in the textbook. In particular, we will be estimating the slope of a curve at a point. A small inexpensive six-inch ruler that you can see through to some extent works well.

General Information

This is a one-semester calculus course with an emphasis on applications.
We will focus on understanding and problem-solving.
Current technology, using computers and calculators, is a powerful tool that can be used not only to by-pass tedious and difficult mathematical manipulations, but can also be used to help see important mathematical connections and patterns.

Calculus is the study of change – the thing changing might be the speed of a car or falling object, the number of cases of a disease in an epidemic, the number of deer in a population, the number of people owning cell phones, the temperature of an object, etc. We may be interested in when the quantity is changing fastest or when it reaches a maximum. Calculus can help us to design an "optimal" container – for example, what shape would be best for a 20-ounce aluminum can if you want to use as little aluminum as possible – how does the surface area change as you change the radius of the can?

Most of the material we will cover is in the following chapters.

Chapter 1: Functions and Change
Chapter 2: Rate of Change: the Derivative
Chapter 3: Short-cuts to Differentiation
Chapter 4: Using the Derivative
Chapter 5: Accumulated Change: the Definite Integral
Chapter 6: Using the Definite Integral
Chapter 10: Mathematical Modeling Using Differential Equations

In chapter 6 we will substitute some applications from outside the book, according to the interests and major fields of members of the class.

Grades will be based on exams, quizzes, and assignments, with the exams counting most heavily (approximately 80%, or possibly more). Some assignments will be done individually, and some may be done in small groups. You can expect a problem assignment to hand in and/or a short quiz about once a week. There will be about 4 exams, including the final. The final exam will be Monday, April 27, 12:00 - 1:50.

Disability services

If you have a need for disability-related accommodations or services, please inform the Coordinator of Disability Services in the Disability Services Office at 2001 C. B. Hedgcock (227-1700; TTY 227-1543). Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation, in accordance with federal, state and University guidelines.

Goals

General

- Understand calculus as the study of change and rate of change

Derivatives

- Understand average rate of change and instantaneous rate of change
- Understand the derivative as rate of change and as slope
- Know how to find the derivative for basic functions
- Understand the relation between the derivative and local maxima and minima
- Understand the relation between the second derivative and inflection points & concavity
- Be able to use the derivative to solve problems in various fields

Integrals

- Understand the definite integral as accumulated change
- Be familiar with the fundamental theorem of calculus
- Be able to use the definite integral to solve problems in various fields

Differential Equations

- Use mathematical modeling with differential equations to solve problems