

## **MATH 220: Calculus I**

Fall 2008, 4 credits, MWRF 8:00-8:50 a.m., MRC 416

Instructor: Richard J Maresh, Assoc Professor of Mathematics

Contact information: Office MRC 521, Phone: (796) 3655, Hours: MWF 10-11, MWR 1-2

Final Exam: Tuesday, 9 Dec 2008, 9:50-11:50 a.m.

**Catalog Course Description:** Limits and Continuity. Derivatives and applications. Differentiation of polynomial, rational, trigonometric, logarithmic and exponential functions. L'Hopital's Rule. Prerequisite: acceptable placement score (or ACT math score of at least 28), or at least 3 years of high school algebra and trigonometry with at least a B average, or a grade of C or better in MATH 180. General Education course: G9.

**Text:** *Calculus: Concepts and Contexts*, 3<sup>rd</sup> Edition. By: James Stewart. Publisher: Thompson, Brooks/Cole, 2005.

### **Course Goals and Objectives:**

Because this course may be taken as part of the General Education requirements, the specific General Education Core Abilities are listed:

- (a) **Thinking:** Students engage in the process of inquiry and problem solving.
  - Students will understand the problems which led to the development of differential calculus.
  - Students will understand the concept of limit, and its application to the derivative.
  - Students will investigate the differentiation formulas and techniques for a wide variety of functions.
  - Students will practice solving a variety of applications of calculus, such as optimization problems and related rates problems.
- (b) **Ethical Decision Making:** Students respond to ethical issues, using informed value systems.
  - Students will understand how academic honesty in mathematics requires deductive reasoning.
  - Students will understand the need to do their own work, and to honestly challenge themselves to understand the material.
- (c) **Communication:** Students speak and write to suit varied purposes, audiences, disciplines, and contexts.
  - Students will participate in class discussions on the material at hand.
  - Students will improve their ability to write solutions to a variety of problems.
- (d) **Cultural Sensitivity:** Students understand their own and other cultural traditions and demonstrate a respect for the diversity of the human experience.
  - Students will develop an appreciation of the history of the calculus and its role in a variety of disciplines.
  - Students will learn to use mathematical notation accurately and appropriately.

The Viterbo University Mathematics program assesses a set of "Student Learning Outcomes" to see whether our majors are learning to do the things a math major requires. In this course we assess the following outcomes:

**SLO-4:** Our majors will demonstrate a basic understanding of axiomatic-deductive systems. (Reasoning)

**SLO-5:** Our majors will demonstrate the ability to apply appropriate mathematical methods to novel or non-routine problems. (Problem Solving)

**SLO-6:** Our majors will demonstrate the ability to perform computational, graphical and algebraic procedures using a calculator or computer. (Technology)

**SLO-8:** Our majors will use the language of mathematics accurately and appropriate in written form. (Communication)

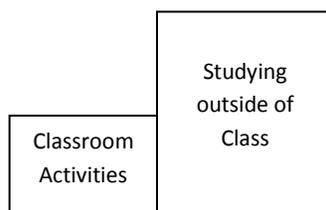
Of course, in Math 220 there are typically a few math majors, along with a collection of majors from the sciences. These learning outcomes are essentially what calculus students should demonstrate, and they are goals that we will work on, but they will only be formally assessed for the mathematics majors.

## Course Policies and Procedures

Probably the best single piece of wisdom I can pass on to you as you begin this course is: “*Mathematics is not a spectator sport!*” You need to view yourself as the LEARNER – and “learn” is an active verb, not a passive verb. I will do what I can to help structure things so that you have an appropriate sequence of topics and a useful collection of problems, but it is up to YOU to DO the problems and to READ the book and THINK ABOUT the material.

You must develop a system that works for you, but let me suggest that it might include finding a study group or coming to me with your questions or going to tutoring sessions in the learning center. In any case you should expect to spend at least the traditional expectation of 2 hours outside of class for each hour in class – this is important! Class time is for exploring the topics and answering questions you might have, but you simply can’t master the material without putting in the time alone to really engage in the mathematics.

Here is a graphic to help you visualize the importance of the work you do outside of class.



Imagine that you were learning to play the piano. It’s a challenge, something of a learned skill but also something of an art, and you know that if you go to those weekly lessons and then go to the next lesson without practicing *a lot* in between, you simply will not become a good piano player.

Learning calculus is very similar. You bring to the class a background of at least two years of algebra, a year of geometry, and a year of pre-calculus, and we will build on all that material. I know the material like the back of my hand, but that’s not the point. The point is that I will help shepherd you along and will try to make the new material understandable – but you still need to practice, practice, practice!

### **Homework:**

The text gives the answers to the odd-numbered exercises in the back of the book, and I generally assign these problems for you to practice on so that you can get that feedback right away. I will not be collecting or grading the homework exercises, but it is nonetheless imperative that you work on them. You needn’t necessarily do all of the assigned problems, but you should expect to spend about 2 hours after each class working on them – anything less and you are shortchanging yourself, and are reducing your odds of success.

In addition to providing you with the necessary practice, the homework assignments will give us material to discuss in class. I expect to start each class by taking up questions raised by your trying to do the assigned exercises.

### **Exams and Quizzes:**

There will be four exams, one at the end of each of the four chapters we will be covering this semester. Each exam will be worth 100 points, 80 of which will come from an individual exam and the other 20 from a group problem set I call a “Practice Exam”; the solution set to these practice exams will be handed out at the end of the period and is intended as one way to help you prepare for the exam.

I will allow you to construct a 1-page set of notes for each exam which you can use in taking the exams. It is always a good learning aid to outline the material covered in a given unit, and this should encourage you to do so. I like to make a portion of each exam basic mechanics problems, but I also will always include a couple problems not exactly like those we have done throughout the chapter – I want to see if you can apply the concepts to new problems.

In addition to these exams there will be occasional quizzes, roughly once a week except for exam weeks. These will be worth 10 or 15 points, and are intended to give you feedback on your progress in the course and, frankly, to encourage you to keep up with the class.

**Grading:**

I use a general grading scale of 90% of possible points for an "A", 80% for a "B", 70% for a "C", and 60% for a "D". I expect we will have approximately 600-650 points during the semester. Depending on how things are going I may give some sort of additional assignment, perhaps when we get into the application problems in chapter 4, for instance.

**Americans with Disabilities Act (ADA):**

If you have a diagnosed disability and require services or accommodations for this class, please inform me and Jane Eddy, the disabilities (ADA) coordinator (MRC 332; 796-3194) within 10 days to discuss your needs.

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**Math 220 Schedule, Fall 2008**

Aug 25	Meeting with Advisors, No class	
Aug 27	[1.1] Representing a Function	p 22 #1, 5, 7, 11, 19-25 odd
Aug 28	[1.2] Mathematical Models	p 35 #1, 3, 5, 9, 13, 15, 17, 21
Aug 29	Quiz #1	
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Sep 1	...LABOR DAY...	
Sep 3	[1.3] New Functions from Old	p 45 #1, 3, 5, 7, 11, 13, 15, 17, 25, 35, 39, 41, 51, 53
Sep 4	[1.4] Graphing Calculators	p 54 #1-23 odd
Sep 5	Quiz #2	
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Sep 8	[1.5] Exponential Functions	p 61 #1-25 odd
Sep 10	[1.6] Inverse Functions and Logs	p 72 #1-49 odd
Sep 11	[1.7] Parametric Curves	p 70 #1-33 odd
Sep 12	Quiz #3	
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Sep 15	Practice Exam #1 (20 points)	
Sep 17	<b>EXAM #1</b> (80 points)	
Sep 18	[2.1] The Tangent and Velocity Problems	p 97 #1-7 odd
Sep 19	[2.2] The Limit of a Function	p 106 #1-19 odd
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Sep 22	[2.3] Computing Limits Using Limit Laws	p 115 #1-33 odd
Sep 24	[2.4] Continuity	p 126 #1-31 odd, 35-41 odd, 47
Sep 25	Review ...	
Sep 26	Quiz #4	
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Sep 29	[2.5] Limits Involving Infinity	p 137 #1-39 odd
Oct 1	[2.6] Tangents, Velocities, Rates of Change	p 145 #1-21 odd, 25
Oct 2	[2.7] Derivatives	p 153 #1-31 odd
Oct 3	Quiz #5	
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Oct 6	[2.8] The Derivative as a Function	p 165 #1-33 odd
Oct 8	[2.9] The Relationship Between $f$ and $f'$	p 172 #1-27 odd
Oct 9	Practice Exam #2 (20 points)	
Oct 10	<b>EXAM #2</b> (80 points)	
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Oct 13	[3.1] Derivatives of Polyn. and Exp. Functions	p 190 #1-47 odd
Oct 15	[3.2] The Product and Quotient Rules	p 198 #1-33 odd
Oct 16	[3.3] Rates of Change	p 210 #1-13 odd, 21
Oct 17	...Mid-Semester Break...	
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Oct 20	[3.4] Derivatives of Trigonometric Functions	p 218 #1-29 odd
Oct 22	[3.5] The Chain Rule	p 228 #1-43 odd, 47
Oct 23	[3.6] Implicit Differentiation	p 238 #1-19 odd, 27-33 odd
Oct 24	Quiz #6	

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Oct 27	[3.7] Derivatives of Logarithm Functions	p 245 #1-33 odd
Oct 29	[3.8] Linear Approximation, Differentials	p 252 #1-25 odd
Oct 30	Review...	
Oct 31	Practice Exam #3 (20 points)	

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Nov 3	<b>EXAM #3</b> (80 points)	
Nov 5	[4.1] Related Rates Problems	p 267 #1-19 odd, 25, 27
Nov 6	[4.2] Maximum and Minimum Values	p 274 #1-45 odd, 51, 53
Nov 7	[4.3] Derivatives and Curves	p 286 #1-23 odd, 29, 37, 39, 51

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Nov 10	Review ...	
Nov 12	Quiz #7	
Nov 13	[4.4] Calculus and Graphing Calculators	p 295 #1-17 odd
Nov 14	[4.5] l'Hospital's Rule	p 303 # 1-45 odd

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Nov 17	[4.6] Optimization Problems	p 311 #1, 3, 5, 9, 11, 13, 15, 19, 21, 23, 25, 33, 39, 43
Nov 19	More on Optimization Problems	
Nov 20	[4.8] Newton's Method	p 325 #1-19 odd, 25, 29
Nov 21	[4.9] Antiderivatives	p 332 #1-29 odd, 35, 41

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Nov 24	Practice Exam #4 (20 points)	
Nov 25-30	... <i>THANKSGIVING BREAK</i> ...	

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Dec 1	<b>EXAM #4</b> (80 points)	
Dec 3	Review...	
Dec 4	Review ...	
Dec 5	<b>Practice Final Exam</b> (25 points)	

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Tuesday, Dec 9, 9:50-11:50 a.m.      **FINAL EXAM** (125 points)