Catalog Description
Polynomial, exponential, logarithmic, and trigonometric functions. Differentiation with associated applications. Introduction to integration with applications. Department-approved graphing calculator required. May not be taken under the CT/NC option. General Education category: M-Mathematics.

Meeting Place and Time
WIH 105, MWF 10 am - 11:10 am

Instructor and Contact Information
Dr. Roger Day
day@ilstu.edu
STV 301J
309-438-3055 (office)

Office Hours
I’m frequently in my office. Please call or e-mail to arrange appointments. Best meeting times:
(1) MW: 1:30 pm – 2:25 pm  (2) Other: Set up an appointment.

Required Textbooks and Materials
Belmont, CA: Brooks/Cole Pub Co. (hardcopy or ebook)
Required: WebAssign Online Assignment Software
Optional: Student Solution Manual and Study Guide

Technology
You are required to have a TI-89 or comparable graphing calculator with CAS capabilities, such as the TI NSpire CAS. I will use a TI-89 or a TI NSpire CAS for most in-class demonstrations. We will also make use of your electronic textbook, your textbook website, www.stewartcalculus.com, and other digital media. Feel free to bring your laptop, tablet, Smartphone, or similar device.

Please subscribe to REMIND, a text-message reminder system, to receive group and individual text-messages from me. Set-up instructions and subscriber information is provided on a separate handout.

A. OVERVIEW OF THE COURSE
Calculus is considered to be one of the greatest intellectual creations of all time. It has been a central factor in expanding our knowledge of the universe. It is the key to analyzing systems that change. Because change is fundamental to every conceivable human activity, the study of change is essential to everyone's intellectual development. We need calculus to understand our world.

Calculus was created more than 300 years ago independently by Isaac Newton and Gottfried Leibniz. Although their intention was to solve particular measurement problems in geometry and physics, today the applications of calculus reach far and wide to not only the physical sciences and engineering, but to the social and biological sciences. In fact, rapid large-scale computing has increased the role of calculus in solving many of the outstanding problems of science and technology.

B. COMMUNICATING MATHEMATICS
Communicating mathematics is an important theme in calculus. The ability to write and explain clearly is crucial to success in the work place. There will be opportunities to develop these skills in this course. Please read the Departmental Guidelines for Writing Mathematics. The Guidelines provide justification for the importance of writing in mathematics. For example, success in your chosen profession will be
based as much on how well you communicate as on what you “know.” Unlike most of the presentations that you complete in college, in which you are communicating with professors, in your job you will often be faced with a much more difficult task — communicating with non-experts. In such situations, it is not enough to say, “Well, you know what I mean.” The process of writing will also help you discover what you don't know. This is invaluable information.

Finally, the Guidelines provide both directions and examples for appropriate mathematical writing and will be used to help evaluate your work. Consider the following questions as your write mathematics:

• How well have you followed directions?
• Is your work coherent and well organized?
• Can another student read your work and learn from it?
• Did you use proper grammar, terminology, and symbols?
• As you submit a project, is it obvious that you refined the final product? Have you removed the redundant material and included sufficient detail?

Opportunities to communicate orally will occur as you work in groups, explain problems to others, solve problems, ask questions, respond to questions, and help your peers understand calculus. Opportunities to communicate in writing will occur as you prepare homework, complete projects, and complete exams and quizzes.

C. COURSE OBJECTIVES

General Objectives: Students will:

• see and appreciate the interdisciplinary role of calculus;
• gain insight into how calculus can be used to describe the world around us;
• learn how to apply the tools of calculus to solve both pure and applied problems;
• enhance your critical thinking and reasoning skills;
• use technology to explore and solve problems;
• communicate mathematics through writing and oral presentations;
• learn some of the historical background of calculus;
• engage in doing mathematics by investigating, conjecturing, and justifying.

Specific Objectives of the Course

After successful completion of the course, you will be able to:

• explain the concepts of function, derivative and definite integral, in writing and orally, using graphical, numerical, and algebraic perspectives;
• determine derivatives of elementary functions (polynomial, trigonometric, rational, exponential, logarithmic), using numerical, graphical, and algebraic techniques;
• determine definite integrals of functions, using numerical, graphical, and algebraic techniques;
• interpret the derivative and definite integral in a variety of problem settings;
• algebraically differentiate elementary functions, using rules for differentiation, including the chain rule, with a high degree of accuracy;
• determine antiderivatives for some elementary functions, directly or using substitution;
• solve optimization problems when provided a reasonable real-world setting and appropriate data;
• apply calculus to solve problems from a variety of fields;
• recognize the need for or use of differentiation or integration in real-world settings;
• relate a function to its derivative and antiderivative, graphically, numerically, and algebraically.

Course Web Site

http://math.illinoisstate.edu/day/courses/current/145/www.html
D. COURSE CONTENT
Real-world applications and technology are used throughout the course to help in understanding the material. Many topics are considered geometrically, numerically, and algebraically. The course content includes:

- the history and origins of the study of change: the beginnings of calculus as a tool to solve physical and geometric problems, an overview of the diversity of applications of calculus from physics, economics, biology, and other fields;
- ongoing review of functions: elementary and piecewise-defined functions, functions defined by tables and graphs, comparative growth, modeling the real world, periodic-function applications, properties of functions;
- the derivative as a measure of rate of change: numerical and graphical interpretations of the derivative, instantaneous rate of change as a limit of average rates of change, local linearity, relationship between derivatives and tangent lines;
- the definite integral: a generalization of continuous summation, its relationship to anti-differentiation (the fundamental theorem of calculus), the solution of a distance problem through study of velocity;
- formulas for computing the derivatives of the elementary functions along with numerical and graphical justifications: related theorems, implicit differentiation, the chain rule;
- applications of the derivative: optimization problems from a variety of real-world situations.

E. CALCULUS AS GENERAL EDUCATION
Because calculus provides such a rich background in problem solving, it helps us understand the world around us from many points of view. In this course we stress problem solving. We will see how the theme of the analysis of change recurs throughout the course and study how and when the methods of calculus can be extended to apply in new problem situations. Part of this process involves developing a feel for situations in which calculus may be appropriate. We will also see some classic applications of calculus to develop an appreciation of the scope and used of the processes of calculus. This background will provide a systematic design for other uses not only of calculus but other methods of quantitative analysis and reasoning.

Calculus means method of calculation and we will be exploring the many applications this method helps us solve. The course is designed to show applications in physics, the field that generated the problems to which calculus was first applied, as well as many other areas including biology, medicine, economics, and chemistry. Throughout these applications, however, the concept of analysis of change and related principles serve as a unifying theme, providing the foundation for logical approaches for modeling, problem solving, application and extension of calculus.

Finally, this course reflects national recommendations for teaching mathematics by: stressing conceptual knowledge and procedural competence; using technology to explore, analyze, and explain; emphasizing clear and precise communication; highlighting connections both within mathematics and between mathematics and other disciplines; and approaching problems from different viewpoints, using a variety of representations, to stress reasoning and sense making (National Council of Teachers of Mathematics, 2000, 2007).

References

Course Web Site
http://math.illinoisstate.edu/day/courses/current/145/www.html
F. COURSE REQUIREMENTS

1. Tests and Examinations
   I plan to administer four tests. Each test will be cumulative. The semester examination will be cumulative and comprehensive.

2. Quizzes, Projects, and Assignments
   There will be many quizzes throughout the semester, including several during the first two weeks as well as Gateway Derivative Quizzes many other weeks. There may be one or more take-home projects or assignments as well. Some quizzes, projects, or assignments may be assigned to groups.

3. Homework
   Homework will be evaluated primarily through required WebAssign submissions. A separate handout describes how to login to WebAssign.

Plan to spend about 3 hours outside of class on work related to the class for every hour of class time!

4. Class Participation
   Your involvement in class activities, discussions, and homework presentations is critical not only for your own learning but also for the learning of others. **I expect you to be prepared for class every day, including being current or ahead on readings and assignments.** I expect you to attend every class session and to be a collaborative participant in the work of the class. This will include being called on to present your solution to a problem or to explain and discuss a calculus concept. I expect you to respect the ideas and thinking of others by listening to their explanations and by asking appropriate questions. Accordingly, because much learning occurs in class and cannot be effectively transmitted through notes, 5% of your grade will be determined by attending class, by being prepared to share and discuss ideas, and by participating fully in class activities. Class participation may be judged through self-evaluation, peer evaluation (from group-work settings), and teacher evaluation. Forms to assist this evaluation may be distributed periodically during the semester.

G. GRADING SUMMARY
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<tr>
<th>Item</th>
<th>Percentage</th>
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<tr>
<td>Tests</td>
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<tr>
<td>Quizzes and Projects</td>
<td>15%</td>
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<tr>
<td>Homework</td>
<td>15%</td>
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<tr>
<td>Semester Examination</td>
<td>25%</td>
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<tr>
<td>Class Participation</td>
<td>5%</td>
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   Semester grades are based on these requirements. Your semester grade will be determined by a scale no more severe than: A: [90,100); B: [80, 90); C: [70, 80); D: [60, 70); F: [0, 60).

H. IMPORTANT DATES
   31 August (Fri)       Last day to drop a course with no withdrawal grade
   12 Oct (Fri)          Last day to drop a full-semester course
   7 Dec (Fri)           Last day of MAT 145
   10 Dec (Monday, 8 PM–10:40 PM)  Semester Exam

Course Web Site
http://math.illinoisstate.edu/day/courses/current/145/www.html
I. CLASS POLICIES

- Your **active involvement** – individually, in small groups, and with the entire class – is an important way for you to help meet the course objectives. To be involved, you must be present. If you are now aware of attendance conflicts or should you become aware of such conflicts, please inform me as soon as possible.

- I expect that all students will engage in class discussions and pay attention to all contributions from the instructors and other students. Likewise, I expect that no student will generate potential distractions such as using e-mail, cell phones, ear phones, text messaging, web surfing, off-topic conversation, or other inappropriate activity. The primary goal of the course is to help each student learn the content to the best of his or her ability. Any activity that does not support that goal is inappropriate for class time. University Policies (policy.illinoisstate.edu/academic/4-1-17.shtml) as well as the Student Code of Conduct (deanofstudents.illinoisstate.edu/conflict/conduct/code) will be cited when questions of behavior arise.

- **Deadlines, test dates, and semester exam dates** described in writing or given verbally are fixed. Plan ahead to complete required tasks on time. **There is no credit for make-up work unless negotiated on an individual basis only under emergency situations and with provision of verifiable documentation.**

- You are expected to maintain high standards of academic integrity, including the honest representation of original work. Individual assignments, quizzes, and exams must be completed independently. A single student’s name on any submission will be considered a pledge that the work is solely that of the student. Collaborative work must identify all contributors. By signing off on a collaborative assignment, you are indicating that work was completed with a fair distribution of time, effort, and input from all members of the group. Students must cite all references that have influenced their thinking and use quotations appropriately when excerpting the work of others. **When using outside resources, you must be fully and accurately cite those sources.** More information about academic integrity can be found in the Student Code of Conduct (deanofstudents.illinoisstate.edu/conflict/conduct/code/).

- **Teacher education candidates** must exhibit professional dispositions outlined in the Disposition Assessment available at http://education.illinoisstate.edu/teacher_education/gateway1/dccassessment.shtml. Failure to do so will result in the submission of a Disposition Concern form.

- Unless announced otherwise, there is no extra credit as a substitute for successful completion of the required components of the course.

- **FREE TUTORING Available:** The Mathematics Department offers drop-in tutoring in STV 330 throughout the week. See department homepage for hours: http://www.math.illinoisstate.edu.

- **MORE FREE TUTORING!** The Julia N. Visor Academic Center provides free weekly tutoring sessions for MAT 145 and other general education courses. To sign up, call (309) 438-7100.
  - Julia N. Visor Academic Center
  - Vrooman 012 (between Manchester and Hewett dorms)
  - http://www.universitycollege.illinoisstate.edu/tutoring

Some Helpful Advice: Because the course moves rapidly, it is essential for you to attend all classes, complete all assignments, and resolve questions as they arise. Especially if you have taken Calculus prior to this semester, you should not rely on prior knowledge. If you have any problems or questions, please seek extra help from me, from your classmates, from mathematics tutors, and from others. Do not make assumptions about policies or assignments that seem unclear. Please ask. The old adage applies here: *the more you put into the class, the more you will get out of it.*

Any student needing to arrange a reasonable accommodation for a documented disability and/or medical/mental health condition should contact Student Access and Accommodation Services at 350 Fell Hall, 309-438-5853 or visit StudentAccess.IllinoisState.edu.

**Course Web Site**
http://math.illinoisstate.edu/day/courses/current/145/www.html
Plan to spend about 3 hours outside of class on work related to the class for every hour of class time!
I, ________________________________, have read the MAT 145 syllabus and understand the course expectations required of me. I agree to follow those policies, meet expectations, and accept the consequences of my decisions and actions.

I have noted all dates listed on the syllabus and schedule and I understand that I am responsible for assignments, quizzes, tests, and semester exam dates, and other deadlines announced in class, even if I am not in attendance. I understand that it is my responsibility to monitor my own learning and seek help, in a timely fashion, when needed. Further, it is my responsibility to fulfill all course requirements.

___________________________________  _______________
Student Signature                    Date

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