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| Instructor: Office: Office Phone: e-mail: Webpage: Office Hours: Calculus Think Tank (CTT) | Dr. Zdeňka Guadarrama Science Center, 120F 816-501-4526 guadarrama@rockhurst.edu www.rumathphysics.org/guadarrama Tuesday 11:00-12:00 Thursday 10:00-10:50 and 12:20-13:00 Friday 11:00-12:00 Monday and Thursday 3:30-5:00 SCIE 302 |
| Meeting Locations and Times | MT 1800 LCB: MTWF 10:00-10:50, Science Center, Room 203 MT 1800 LCC: MTWF 12:20-1:10, Science Center, Room 203 |
| Required Materials | <u>Text:</u> <i>Calculus: Single Variable</i> , Hughes-Hallett, Gleason, McCallum, et al. Wiley, 4 th Edition, 2005 ISBN: 0-471-48482-2 <u>WebAssign:</u> WebAssign Student Access Code: purchase online at www.webassign.net or in RU bookstore <u>Calculator:</u> Texas Instruments Scientific Calculator, TI-30X IIB, available for sale at the Rockhurst University bookstore |
| Course Websites | <ol style="list-style-type: none"> For homework on-line assignments, and all grades: WebAssign online homework system at http://www.webassign.net For worksheets, class materials, labs, syllabus and general information http://rumathphysics.org/guadarrama/teaching.html |
| Network Access | <u>Server:</u> Isabel <u>Folder:</u> MT 1800 |
| Other Resources | <u>Computer Labs:</u> Science Center Rooms 203 and 205. For locations and availability of other computer labs on campus, see: http://www.rockhurst.edu/services/computer/labs.asp <u>Learning Center:</u> VanAckeren 200. Walk in math tutoring during most times at which Learning Center is open: M-Th 8:00am – 8:00pm and Fri. 8:00am – 4:30pm. <u>Calculus Think Tank:</u> Science Center 302, Monday and Thursday 3:30 pm - 5:00 pm |
| Examinations: | <u>VERY tentative test dates:</u> Friday, September 12 Exam 1 over Chapter 1 Friday, October 3 Exam 2 over Chapter 2 Friday, November 14 Exam 3 over Chapters 3 & 4 <u>Final Exam</u> MT 1800 LCB: (10:00-10:50 class), Wednesday December 10, 10:30-12:30. MT 1800 LCC: (12:20-1:10 class), Thursday December 11, 8:00-10:00. |

General Procedures

Homework, Labs & Projects:

Homework will be assigned for each section of the text. You will submit homework assignments online, using the *WebAssign* online homework service. One major advantage of online homework is that you will receive immediate feedback on your work. You are expected to complete the homework assignments according to the schedule that will be distributed for each chapter. Late online assignments will not be accepted, but your two lowest *WebAssign* homework grades will be dropped. Assignments will be relatively short, with frequent due dates to ensure that you do not fall behind the course material.

Access to the WebAssign online homework service: Log on to WebAssign by going to <http://www.webassign.net>

You must then enter the following login information:

Username: your 6-digit RU ID#

Institution: rockhurst

Password: your initial password is "password"

Once you log on to WebAssign, you will have full access to all homework assignments, announcements, etc. However, you **MUST** purchase a *WebAssign Student Access Code* within the first 10 days of the course. You can purchase the access code from the RU bookstore or online from WebAssign directly. Once logged on to WebAssign (with the above login information), you will be prompted to enter your access code or to purchase it online. Your access code only needs to be entered once, and as mentioned above, must be entered within 10 days of the start of the course.

An important note about homework in this course: An important part of developing conceptual understanding in mathematics is challenging the student to apply concepts in novel ways. This is precisely what is intended in some of your text homework problems. They may ask you to apply concepts learned in class in ways that you are *not* necessarily familiar with. Such problems can cause anxiety in students. So we ask that you approach them with patience doing the best that you can, with your class notes open so that you can find the more subtle connections that are needed.

The submission dates for all other course work (labs, worksheets and projects) will be announced with each assignment. Assignments will be docked 25% for each day they are late. Students who are off campus representing Rockhurst University must make arrangements to submit their assignment at the assigned time. If special circumstances arise, see your instructor.

Lab and group project teams are encouraged to consult with others (in and out of the course), but the team members must write the final report. When completing individual assignments, you are encouraged to work with others unless specifically instructed otherwise. Again, the final work you submit for grading must be your own.

Additional Group Problem Sessions:

Each student will have the option of attending group problem sessions for extra credit (held twice every week). If a student's grade in the course (as indicated at the beginning of the week by webassign) is less than 85%, then they are required to attend the group problem session that week. If a student's grade in the course is currently greater than 85%, then attending that week's group problem session is optional. Your instructor will set a regular meeting day/time/room (Fall 08: Monday and Thursday 3:30-5:00, room Science Center 302) for these problem sessions, and each student must attend in a group of at least 2 students. During the problem sessions, students will work together (on white/chalk boards) in their groups on questions that they have been having problems with or on additional homework problems. Instructors will be available in the problem session room to answer questions when

needed. For full credit, correct solutions must be presented (orally, on the white board) to the instructor. All group members must demonstrate an understanding of the concepts involved and the solution methods used.

Unit Examinations:

There will be three one-hour, in-class, unit exams. A make-up exam will only be considered if you notify your instructor within 24 hours of the beginning of the exam that you missed. If you schedule a make-up exam and miss your appointed make-up time then you will have no further option to take a make-up exam.

Individual Learner Packets:

Each student may choose to complete an individual learner packet for each unit exam. If the learner packet is completed satisfactorily the packet will count for 20% of the student's grade for that exam and the grade attained on the exam will make up the other 80%. For instance if you achieved a 70% on the exam and you had completed the individual learner packet successfully then you would achieve a $.7 \cdot 80 + 20 = 76\%$ as your grade in total for that exam.

Each learner packet should consist of the following:

- Summary of the material for that exam including a detailed outline of the key concepts and helpful examples,
- A completed practice exam,
- Additional questions completed from each section covered on that exam,
- All corrected and completed course activity worksheets, and
- A reflection paragraph – reflecting on some or all of the following: how different concepts from that unit fit together, how new concepts fit with old concepts, how effective (in terms of aiding your own learning) you found the coursework for that unit, how effective you found the process of completing this learner packet, how confident you feel going into this exam.

If you choose to participate in this for the first unit exam, **you must meet with your instructor within the first two weeks of class (by Wed., February 6th)** to discuss the details of the packet which you will prepare. You may also decide to participate for any of the other unit exams.

Final Exam:

The final exam in this course will be comprehensive, covering material from all unit exams as well as some new material. The final exam dates are given below:

Course Weights:

The course grade will be determined using the following weights:

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| Online WebAssign Homework | 20% |
| Laboratory reports, projects, worksheets, and other | 20% |
| One-hour exams | 40% |
| Final exam | 20% |
| Total | 100% |

Grading Scale:

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| 94-100 | A |
| 90-93 | A- |
| 87-89 | B+ |
| 83-86 | B |
| 80-82 | B- |
| 77-79 | C+ |
| 73-76 | C |
| 70-72 | C- |
| 67-69 | D+ |
| 63-66 | D |
| Below 63 | F |

Course Philosophy

The purpose of this course is to demonstrate that mathematics can be a powerful tool for solving *real* problems in the natural and social sciences. While computational skills will be important, preparation for real problem solving is developed by placing the emphasis of the course on conceptual understanding. This course has been designed to use selected problem areas in the natural and social sciences to motivate the introduction of calculus concepts and techniques. It uses a discovery-based computer laboratory, conducted much like a laboratory for a science course and it requires writing assignments that place the emphasis of the course on conceptual understanding, not solely on computational skills.

Course Objectives

Mathematics has the extraordinary power to reduce complicated problems to simple rules and procedures. Therein lies the danger in learning mathematics: it is possible to learn mathematics as nothing but a collection of rules and procedures - thereby losing sight of both the mathematics and of its practical value in solving *real* problems. In this course, we broaden our approach to learning mathematics by refocusing on conceptual understanding. We have found that learning multiple ways of representing mathematical ideas (multiple representations – the *Rule of Four: symbolic, numerical, graphical, and verbal*) encourages students to reflect on the meaning of the material. The central mathematical idea in this course is *rate of change* and its role in *modeling*. This course, therefore, has two *primary learning objectives*:

Students should be able to:

- understand, explain, and apply the concepts of derivative and rates of change in graphical, numerical and symbolic/analytical contexts;
- construct mathematical models from data or from theoretical propositions;

Supporting the two key objectives listed above are the following *secondary objectives*:

- understand, explain, and apply the concept of a function in a variety of representations, including tabulated data, graphs and formulas;
- identify and solve applied rates of change problems by appropriately choosing and applying the concept and rules of derivative;
- formulate problems involving rates of change as initial value problems;
- solve initial value problems both numerically and analytically, provide a rationale for these solutions, and use these solutions to solve subsequent problems;

- differentiate a variety of functions (given as formulas);
- understand, explain, and apply the relationship between data and theoretical models as a means of examining/analyzing real-world phenomena;
- communicate mathematically by reading for understanding and writing explanations of mathematical ideas and results in clear prose using proper mathematical notation;
- use the computer (and independently identify when the computer *can* be used) as a computational/graphical/algebraic tool for solving mathematical problems or as a tool for experimenting to discover/understand mathematical concepts;
- apply calculus concepts to new situations.

Course Design

Developing conceptual understanding and the ability to apply concepts to real problems is not easily done in traditional lecture classes. It requires your active involvement, interest and creative energy. For this reason we use a variety of teaching methods all designed to promote self-discovery of mathematical fact, cooperation with other students and personal involvement in the learning process. These methods may include: (1) computer laboratory projects, (2) in-class group projects and worksheets, (3) in-class data collection and analysis, (4) interactive classroom computer demonstrations, (5) extended discussions built from student questions, and (6) reading assignments intended to convey the basic factual information of the course.

You must read the assigned text materials before coming to class. We will spend little time in class going over what you have read; class time will be used for questions, discussions, and group activities based on the reading. We stress that this must be active reading. Work the examples; write comments in the margins. What you learn depends on what you DO, not on what you passively read in your room or drowsily hear in class. This is an active course! Most of the time you will be participating in the solution of a problem or conducting an experiment, not sitting back and watching others.

Since emphasis in the course is on conceptual understanding, many investigations will require written explanations and some will require full written reports. The standard for your written work will be the same as that expected of you in your Reading and Rhetoric Courses (EN 1110, EN 1120, EN 1140).

Cooperation and collaboration with your fellow students is also an important part of the course.

The Role of Technology

Technology will play a major role in this course. We are committed to promoting *conceptual understanding* by using *modern technology* to explore *real-life applications* and *mathematical ideas*. We will use technology for computation, to produce graphs of data and functions, to build mathematical models, and even to symbolically differentiate functions. It will also be used for exploration of mathematical ideas. You are required to bring your scientific calculator to class (TI-30X IIB, see required calculator in table on first page). We will also use a powerful Computer Algebra System (CAS) called *Mathematica (Version 6.0)* that runs on the campus PC network.

Although it is neither necessary nor required, you may wish to purchase a student version of *Mathematica 6.0* in order to complete computer assignments at home or in your dorm room. The student version of *Mathematica 6.0* may be purchased through the Wolfram website <http://www.wolfram.com/products/student/mathforstudents/>.

Email Policy:

All students are required to activate and regularly check their Rockhurst email accounts. In this course, all electronic communication between faculty and students will be done through official Rockhurst email accounts. Student contact information must be kept current in order to receive important notices from Rockhurst University. Your contact information is online via your OracleWeb account. Please check your local address, local phone number, and emergency contact information on OracleWeb and revise as needed. **All important University notices will be sent only to your RU email address.** Please check your RU email account in addition to any other email accounts you may have. Accounts are activated at the Computer Services Help Desk (Conway, fourth floor).

Attendance Policy:

The Attendance Policy of Rockhurst University as described in the catalog (page 48) will be utilized in this class. Regular attendance is mandatory; in compliance with the University's attendance policy found in the *Rockhurst Bulletin* and the *Student Handbook*, if you accrue nine absences you will likely receive an F in the course.

Since much of the work in this class will be done with your team partner, missing class will leave your partner to do all the work. Students who hurt their partner in this way will be removed from their team and will work alone for the remainder of the semester. If you know ahead of time you are going to be absent from class, please inform your team partner and see the instructor to arrange to get caught up with class work.

Academic Honesty Policy:

Consistent with its mission as a learning community, Rockhurst has a commitment to foster an environment of academic integrity. To this end, issues involving academic dishonesty in this course will be resolved through the process outlined in the College's Academic Honesty Policy. A statement of this policy can be found in the *Rockhurst Bulletin* and the *Student Handbook*.

From the Access Office:

Rockhurst University is committed to providing reasonable accommodations for students with disabilities. Please contact Sandy Waddell in Access Services (Massman Hall, Room 7, 501.4689, sandy.waddell@rockhurst.edu) to provide documentation and request accommodations. If accommodations have already been approved by the Access Office, please communicate with the instructor(s) of this course regarding these arrangements by the second week of class in order to coordinate receipt of services.

Classroom Conduct:

Students in this class are expected to behave in accordance with the Rockhurst Student Code of Conduct. You must be respectful of your classmates, your instructor, and the rules of Rockhurst University. If your behavior disrupts or obstructs the academic process, you may be dismissed from the classroom. Repeated instances of such behavior may result in permanent withdrawal from the course. For more information, see the *Student Handbook*.