

MATH 223 (Spring 2012)

CALCULUS III – Multivariable Calculus

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Office Hours: MWThF 2-4 pm, and by appointment
If not in office check the MSC
Course website: This course has a Moodle website.

Section 223-01 meets MWF 10:00 – 10:50 in Ohlendorf 225

Course Description: Calculus I & II focus on developing the calculus of functions of one variable, $y = f(x)$ (here the one variable is x). In this course, we develop the calculus of functions of multiple variables, for example $f(x, y)$ (here the function f depends on two variables x and y). As we go through this course we will look at several ways to conceptualize and mathematically study functions of multiple variables. Once we have developed the mathematical theory and notation of functions of multiple variables, we will develop calculus methods for studying limits, derivatives, and integrals of these functions.

Prerequisites: Calculus II

Course Materials:

- *Text:* Multivariable Calculus by James Stewart. The hybrid edition sold by the bookstore does not contain the homework problems, but the problem sets will be posted on Moodle. We will cover portions or all of chapters 10, 12, 13, 14, and 15 in the textbook.
- *Student Solution Manual:* There is a student solution manual containing worked out solutions to odd problems available. This can be a valuable tool for checking your work and seeking helpful hints when working through homework exercises.
- *Supplemental materials:* You are responsible for all handouts given in class and materials posted on the course website.

We will not often use calculators in this course. However, if you feel you want one for some numerical computation, you may use a scientific calculator (NOT a graphing calculator!). I recommend TI-30X IIS (\$13.24 on Amazon) or TI-36X Pro (\$20.53 on Amazon). You will NOT be allowed to use a scientific calculator app on your phone.

Time Commitment: In addition to the time spent in class (4 hours a week), *you should expect to spend between 9 – 12 hours outside of class engaged in homework and study.* If you choose to participate in the peer-led study groups (see last page of syllabus), count this as part of your study time. Please be aware of the level of time commitment for this course when planning extracurricular activities.

Course Grading:

| <u>Component</u> | <u>% of Grade</u> |
|----------------------------|-------------------|
| Graded Homework Problems | 20 % |
| Practice Homework Problems | 15 % |
| Exams (3 total, 15% each) | 45 % |
| Final Exam | 20 % |

“Learning is experience. Everything else is just information.” – Albert Einstein

Homework: There will be one homework exercise set for each section of the text we cover. A homework exercise set will consist of two parts: **practice exercises** and **graded exercises**.

The **practice exercises** will be odd numbered problems in the text and you will need to check and compare your solutions to those in the student solution manual. The practice problems are to be done on blank 8.5” × 11” white paper. See sheets at the end of this syllabus for an example (copies are posted on moodle). Your name, the section number, and the date should be written at the top of each page, and the page number in the bottom right of each page. The remainder of the page is to be divided into two columns. In the left column, work the assigned practice problem. After you have worked the problem, check your answer in the student solution manual. If you worked the problem correctly, indicate that you did so in the right column. If the problem is incorrect, identify where you went wrong, and record this in the right column. Being able to identify where an error has occurred is a very important skill! The grading for practice problems will be based on completion, so do not worry about getting every problem completely correct.

| <u>% of Practice Problems Completed/Attempted</u> | <u>Grade</u> |
|---|------------------------|
| 80 – 100 % | Full credit (2 points) |
| 20 – 80 % | Half credit (1 point) |
| 0 – 20 % | No credit (0 points) |

* Percentage of problems will be rounded up to the nearest problem. So if 80% is 9.2 problems, then you must do 10 problems to receive full credit.

Two practice exercises grades will be dropped when computing the final grade.

The **graded exercises** will be 3 even numbered problems. At least one of these will be a challenging problem designed to stretch your mind and understanding of calculus. Each graded problem will be graded on a 10 points scale since that is the typical amount of points given to an exam problem. Use the graded homework as an opportunity to gauge your understanding. Write up the solution as if it were on an exam. For full credit, write neatly and show all your work.

Each homework set will be collected two class days after a section is completed. For example, if we finish a section on Friday, the homework for that section will be due the following Wednesday. If you are absent the day a homework set is collected, you are still responsible for making sure your homework is turned in to your instructor. No late homework will be accepted.

Additionally, there will be three **homework projects** which will be counted as multiple homework assignments. The first homework project will count as 5 practice homeworks, and the second two homework projects will count as 5 graded homeworks each.

On occasion, some graded problems will be assigned for extra credit. This will be a way to make up extra points, or make up for a missed assignment.

“I hear and I forget. I see and I remember. I do and I understand.” – Confucius

Homework Collaboration Policy: Working together with other people is a great way to learn mathematics. I encourage you to work together on the homework, if you find that it helps you to learn. However, homework for this course is also graded, as part of your final course grade. Each student must write up his or her own homework solutions. By handing in homework solutions to be graded, you are promising that you took part in solving the problems, and that you are not just copying someone else’s work. Handing in homework to be graded when you did not participate in solving the problems is a violation of the Honor Code.

Exams: Three exams will be given (the first will cover Chapter 10 material, the second Chapter 12 & 13 Material, the third Chapter 14 Material). Each exam will be scheduled approximately one week after we finish the material for that exam. The material in Chapter 15 will be tested on the final. In order to remove the pressure of a time constraint, these exams will be given on a Thursday evening with a wide window of time (5-6 hours). You may take the exam for as little or as much of that time as needed. However, the exams will not be designed to take the full length of time. A make-up exam will only be given if both of the following two conditions are satisfied:

1. You contact the instructor prior to the test being given (at least one week in the case of absence due to the attendance of an official school function).
2. You provide the proper documentation.

Final Exam: The final exam will cover all material covered in this course.

Section 223-01: Final Exam on Monday, April 30 @ 5:30 pm (Ohlendorf 225)

Final letter grades are determined as follows:

| | | | |
|-----|-------------|-----|-------------|
| A | 93 – 100 % | C | 73 – 76.9 % |
| A - | 90 – 92.9 % | C - | 70 – 72.9 % |
| B + | 87 – 89.9 % | D + | 67 – 69.9 % |
| B | 83 – 86.9 % | D | 63 – 66.9 % |
| B - | 80 – 82.9 % | D - | 60 – 62.9 % |
| C + | 77 – 79.9 % | F | 0 – 59.9 % |

Disability Services: If you need course adaptations or accommodations due to a documented disability, please contact the Office of Disability Services at Burrow Student Center, Fourth Floor, 901-843-3885. Hours: M-F, 8:30 am – 5:00 pm. See <http://www.rhodes.edu/disabilityservices/default.asp> for details.

Classroom Etiquette: Please be considerate of the instructor and your classmates around you. Come to class on time and stay the entire period. Turn off cell phones or any beeping/ringing devices during class (this means no sending text messages during class).

The Honor Statement:

You are expected to conduct yourself within the guidelines of the College’s Honor Code. If you have any questions about what is or is not allowed, please ask.

The note that this syllabus is a guide and not a contract, and thus is subject to change at the discretion of the instructor.

Name _____ Section _____ Date _____

#1 Find $\frac{dy}{dx}$ if $x^2y^2 + x\sin y = 4$

$$\frac{d}{dx}(x^2y^2 + x\sin y) = \frac{d}{dx}(4)$$

$$2xy^2 + 2x^2y \frac{dy}{dx} + \sin y + x\cos y \frac{dy}{dx} = 0$$

$$(2x^2y + x\cos y) \frac{dy}{dx} = -(2xy^2 + \sin y)$$

$$\frac{dy}{dx} = - \frac{2xy^2 + \sin y}{2x^2y + x\cos y}$$

Solution & work are correct!

#3 Find the average value of $f(x) = 4x - x^2$ on the interval $[0, 4]$

$$\int_0^4 4x - x^2 dx$$

$$= \left[2x^2 - \frac{1}{3}x^3 \right]_0^4 = 2(16) - \frac{64}{3} = \frac{32}{3}$$

Forgot to divide by length of integral.

$$\frac{1}{4} \int_0^4 4x - x^2 dx$$

#9 Evaluate $\int t \sec^2 2t dt$

$$\text{Let } u = t \quad dv = \sec^2 2t dt$$

$$du = dt \quad v = \frac{1}{2} \tan 2t$$

$$\int t \sec^2 2t dt = \frac{t}{2} \tan 2t - \int \frac{1}{2} \tan 2t dt$$

$$= \frac{t}{2} \tan 2t - \int \frac{\sin 2t}{\cos 2t} dt \quad \text{Let } u = \cos 2t$$

$$= \frac{t}{2} \tan 2t + \frac{1}{2} \int \frac{1}{u} du \quad \begin{array}{l} du = -2\sin 2t dt \\ -\frac{1}{2} du = \sin 2t dt \end{array}$$

$$= \frac{t}{2} \tan 2t + \frac{1}{2} \ln|u|$$

$$= \frac{t}{2} \tan 2t + \frac{1}{2} \ln|\cos 2t|$$

Lost the coefficient $\frac{1}{2}$

forgot integration constant +C