Math 122: Calculus II **2020**

Calculus: Early Transcendentals, Smith & Minton, Chapters 5,6,8,12,13

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minton@roanoke.edu at calendly.com/minton/15min

Course Objectives: *Continue to learn how to do mathematics!* Mathematics is a problem-solving discipline, and we are all constantly learning. The best way to learn is to focus on technique and not on memorization. My role as professor is to guide discussions and help you take the next step from wherever you are mathematically. One objective is for you to have a sound enough understanding of calculus that you can recognize it and apply it in future courses. This will not happen if you have just memorized your way through some problems. A broader objective is for you to be a good problem-solver, to help you excel at whatever entrance examinations and job situations are in your future. Finally, an important objective is to enjoy the course. Calculus is the gateway to the awesome world of modern science. Let yourself be amazed!

Intended Learning Outcomes: At the end of the course, successful students will be able to

- Apply appropriate tests of convergence to a variety of infinite series
- Apply power series to solve problems in modern mathematics
- Recognize and interpret different applications of integration
- Apply multivariable calculus techniques to compute quantities of interest
- Recognize the role of technology in calculus, understand when it should be used, and be aware of its limitations

Attendance Policy: Regular attendance is expected. This means both physical and mental attendance. For most students, taking notes and asking questions are good ways of making the best use of class time. You are responsible for everything done in class, through your attendance and sharing class notes with classmates. If you miss a class, e-mail me before class is over and explain why. **If you have two unexplained absences, you will be dropped from the course after being sent a warning notice.**

Equipment: We will use Mathematica, a powerful mathematical software package, in class and in labs. A personal copy for your personal computer is recommended, so that you can have it in class daily. Regular visits to your Inquire site (for all of your courses) is required. Assignments, extra materials, and grades will be posted regularly.

Academic Integrity: The college policy is fully supported. Tests are closed notes, closed book. You may always ask me for help on homework and labs. **Do not** copy homework or any portion of a lab report. No electronic devices other than calculators are allowed in a test situation.

Co-Curricular: During the course of the semester, you must attend at least two co-curricular events approved by the MCSP department. For each, write a two-paragraph description of the event, due within a week of the event. A sample is provided on the Inquire site. Schedules for the talks can be found online at the MCSP department website and in Trexler hallways.
https://www.roanoke.edu/inside/a-z_index/math_cs_and_physics/conversation_series/spring_2020

I expect you to spend at least 12 hours of work each week inside and outside of class.

Homework: A problem set will be due each Friday (excluding week 1) that we do not have a test. These will be assigned on the previous Friday and each are worth a total of 25 points. There are two parts to each problem set. The first part is worth 10 points and will be graded based on effort and completeness. This part consists of the three daily homework assignments for the previous three class periods (assigned on Wednesday, Friday, and Monday). Daily homework will include roughly 5-10 questions and you are welcome to ask questions about them at the beginning of class. The second part of each problem set is worth 15 points and will be graded based on correctness and presentation. Each week you will complete 3 problems which will be carefully graded. Each of these problems is worth 5 points, with 4 points for correctness and 1 point for presentation. When you turn in your problem set on Friday, make sure the three problems graded for correctness are on top and then below are your three daily assignments. Your homework should be neat, organized, and stapled. No late homework will be accepted and solutions will be posted on the following Monday. For the first week we will have a single problem assigned below, due Friday, to get you accustomed to the grading; it will be worth 10 points. You can collaborate on problem sets but you must **write up your own solution**. If you are looking at another person's work or asking someone what to do next while writing up your problem set, then you are in violation of the academic integrity policy of Roanoke College.

Extra Credit: You may earn extra credit in several ways. My intent is to encourage you to have fun with mathematics, and that is the grading criterion that I will use – so have fun learning! You may check out from the Roanoke College library and report on "popular" mathematics books. You may report on mathematical web sites that have good calculus demonstrations or extra material. You may attend more than two of the approved co-curricular events. Please realize that this is not a means for turning a C into an A. The main rule is to do this now. Waiting until the end of the semester will distract you away from the end-of-semester studying that you need to do.

Labs: There will be four labs. Class time will be available to work on these problems and ask questions – use this time wisely! The lab reports will be graded based on clarity, correctness, and engagement (minimal answers get a minimal grade). Labs will be done in groups of two or three with groups assigned.

Tests: There will be four tests and a final exam. Each test will cover all material discussed since the previous test. Anticipated test dates are (W) 2/5, (F) 2/28, (F) 3/27 and (F) 4/17.
The exam is Thursday, April 23, 2:00-5:00.

Make-ups: In case of sickness or scheduling conflicts, get in touch with me ASAP.

Grading: The lab reports count 20% of the final grade. Homework, co-curricular and class participation count 20%. Tests and the exam count 60% (12% each). Grades may be curved up based on extenuating circumstances.
A: 93-100 A-: 90-92
B+: 87-89 B : 83-86 B-: 80-82
C+: 77-79 C: 73-76 C-: 70-72
D+: 67-69 D: 63-67 D-: 60-62
F: 59 and below

MATH 122 DAILY SCHEDULE
First half

1/13 Review 5.5 Projectile Motion
1/15 Section 5.5 Projectile Motion
1/17 Section 5.1 Area Between Curves

1/20 Section 5.2 Volume
1/22 Section 5.6 Applications of Integration
1/24 Section 5.6 Applications of Integration

1/27 Lab 1
1/29 Section 5.7 Probability
1/31 Section 6.2 Integration by Parts

2/3 Review
2/5 TEST #1
2/7 Section 6.6 Improper Integrals

2/10 Section 12.1 Functions of Several Variables
2/12 Section 12.3 Partial Derivatives
2/14 Lab 2

2/17 Section 12.7 Extrema
2/19 Section 12.7 Extrema
2/21 Section 13.1 Double Integrals

2/24 Section 13.2 Area, Volume
2/26 Review
2/28 TEST #2

SPRING BREAK

In the event of a MWF class being cancelled, the schedule will temporarily be moved back one class period (e.g., the section that would have been covered on Monday would be covered on Wednesday) and then a new schedule will be handed out to you later.

MATH 122 DAILY SCHEDULE
Second half

3/9 Section 9.4 Polar Coordinates
3/11 Section 13.3 Double Integrals in Polar Coordinates
3/13 Section 13.3 Double Integrals in Polar Coordinates

3/16 Section 8.1 Sequences
3/18 Section 8.2 Infinite Series
3/20 Lab 3

3/23 Section 8.5 Ratio Test
3/25 Review
3/27 TEST #3

3/30 Section 8.6 Power Series
4/1 Section 8.6 Power Series
4/3 Section 8.7 Taylor Series

4/6 Section 8.7 Taylor Series
4/8 Lab 4
4/10 Section 8.8 Applications

4/13 Section 8.8 Applications
4/15 Review
4/17 TEST #4

4/20 Review

Thursday 4/23 FINAL EXAM 2:00-5:00

MATH 122 STUDY PROBLEMS

(Note: W2 refers to writing exercise #2, but #2 refers to "regular" exercise #2.)

Try as many of these problems as you can and ask questions about the ones you don't understand. Test questions will be modeled on these questions. You do not need to turn these in. Work on them with others, ask me questions, and understand the material!

Section 5.5 Projectile Motion
Study: p420 #3-12, 21-26, 35, 37, 43, 46

Section 5.1 Area Between Curves
Study: p383 #3-8, 19-24, 43, 45

Section 5.2 Volume
Study: p398 #7-10, 17-20, 25-26

Section 5.6 Applications of Integration
Study: p433 #15-18, 21-32

Section 5.7 Probability
Study: p441 #3-10, 19-22, 27-30

Section 6.2 Integration by Parts
Study: p457 #1-8, 19-22, 43-44

Section 6.6 Improper Integrals
Study: p457 #1-5, 7-11, 16-18, 49-50

Section 12.1 Functions of Several Variables
Study: p826 #3-4, 7-8, 27-32, 43, 57-59

Section 12.3 Partial Derivatives
Study: p849 #1-6, 11-14, 39-40, 57-58

Section 12.7 Extrema
Study: p.892 W3, #3-10, 31-34, 45-50, 56-58

Section 13.1 Double Integrals
Study: p.922 5-8, 11-16, 25-30, 39-46

Section 13.2 Area, Volume
Study: p.931 3-6, 11-18

Section 9.4 Polar Coordinates
Study: p666 #1-4, 7-10, 19-22, 27-32

Section 13.3 Double Integrals in Polar Coordinates
Study: p.939 1-4, 7-10, 17-24, 31-36

Section 8.1 Sequences
Study: p550 W1, #11-24, 61-62

Section 8.2 Series, geometric series, harmonic series
Study: p559 W1, #1-6, 8-9, 11-12, 17-20, 49, 59

Section 8.5 Ratio Test
Study: p585 #1-4, 7-8, 11-12, 33-38, 61

Section 8.6 Power Series
Study: p593 W1, #1-12, 19-22 (radius), 25-38

Section 8.7 Taylor Series
Study: p605 W1, W3, #1-6, 9-12, 15-18, 25-32

Section 8.8 Applications of Taylor Series
Study: p613 W1, #1-18, 33-36

Turn In for Correctness Friday, January 17, beginning of class (9:40)

Wile E. Coyote discovers that he has just stepped off the edge of a cliff. Three seconds later, he lands in a cloud of dust. (a) How tall is the cliff in meters? On the way down, he brushes against a boulder that is 20 meters above the ground. (b) How many seconds into the fall does this happen? The boulder is dislodged and falls on the coyote. (c) How fast is the boulder going when it hits the coyote?

This will be graded on correctness, completeness, and presentation. It does not have to be typed (if you do, you can just email it to me) but please be neat and organized. If you make mistakes and need to cross out something, start over and turn in a neat copy.

This is worth 20 points, 14 for correctness and 6 for presentation. I do not need complete sentences but I do want to see all of the steps and see explanations when needed. For example, I want you to start with the equation for acceleration and find equations for velocity and position. You will want to use a calculator or Mathematica for calculations. If you are not clear whether you need to show certain steps, ask!

Papers turned in after the beginning of class will lose the presentation points, and papers will not be accepted after Friday midnight.

Math 122 Information Sheet

Name:

Email:

Cell phone:

Intended Major:

Hometown:

List any other college math courses you have taken.

Briefly describe why you think math is useful.

What are your expectations and goals for this course?

What are some of the co-curricular or other campus activities you would like to participate in this year?