Calculus II
(Math 220 Section 2, Spring 2017)

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Class Times: Monday, Wednesday and Friday 1:00–1:50 and Thursday 1:40–2:55.
Class Location: Maybank Hall room 223, and possibly sometimes in room 200.
Final Exam: May 5, noon–3 pm, Location TBA (probably the normal class room)
Office hours (revised): From 10:30–11:30am on Monday and Wednesday, and 10–11am on Thursday; I am also available immediately after each class, and by appointment.
Prerequisites: MATH 120 or HONS 115.

Text: There are several options.
For this course alone, you can use either Single Variable Calculus: Early Transcendentals by James Stewart, 8th. edition, or the less expensive loose-leaf CofC custom edition. If you plan to continue to Calculus 3 (Math 221), you will need the extended version Calculus: Early Transcendentals; the loose-leaf version also works for that. You also need WebAssign access to go with this; see below.

This course will use two main online tools:

- The OAKS "learning management system" https://lms.cofc.edu (which is also accessible from within https://my.cofc.edu).
- The online homework system WebAssign at https://www.webassign.net/ This is bundled with the loose-leaf edition of the text, or can be purchased directly through the WebAssign website.
Course Objectives and Student Learning Outcomes

The main objective of this course is to learn three main topics:

Integration and its Applications: Chapters 6, 7 and part of 9.
Infinite Sequences and their Sums: Chapter 11.
Geometrical Applications of Calculus: selections from Chapters 8 and 10.

For example we study computing areas and volumes, lengths of curves, and solving differential equations which describe phenomena like population growth, and describing functions as “infinite polynomials”, also called “power series”.

I will also emphasize some generally useful mathematical skills:

- Learning correct use of mathematical notation and organization of thinking and written presentations so that it can be understood by peers and instructors.
- Facility and accuracy in basic computational manipulations so that these steps do not get in the way of understanding and solving the main questions at hand.
- Reading, working exercises and developing concise written summaries of important formulas, notation and ideas, to help with study and test preparation.

Students are expected to do not only the graded online assignments and class exercises but also to read each section of the text that is covered in class, and to attempt the exercises set for each section. This is because, more broadly, it is expected that a majority of the learning in this or any College course comes through students’ efforts outside the classroom.

By the end of the course, students will be able to:

1. Represent the following as definite integrals: area between curves, volume of a solid of revolution, average value of a function, arc length of a curve.
2. Evaluate integrals by applying integration by parts, trigonometric substitution, trigonometric identities, and partial fraction decomposition.
3. Identify and evaluate improper integrals and apply the comparison test to determine whether an improper integral converges.
4. Identify properties of sequences (monotonicity, boundedness, convergence) and find the limits of sequences.
5. Determine whether an infinite series converges by choosing and applying a suitable convergence test.
6. Determine the radius of convergence of a power series.
7. Use Taylor Series to express functions as power series and to evaluate infinite series.
8. Represent plane curves as parametric equations, and recognize the plane curve that corresponds to given parametric equations.
9. Use derivatives and integrals to find slopes and lengths of parametric curves, and areas bounded by them.
10. Convert between Cartesian and polar coordinates, graph polar curves, and apply calculus to polar curves as for parametric curves.
11. Model mathematical questions with differential equations, and use basic methods for solving such equations.
Undergraduate Mathematics Program Student Learning Outcomes

This course can be used to satisfy some requirements of the undergraduate mathematics degree program, for which there are also some standard objectives.

1. Using algebra, geometry, calculus and other track-appropriate sub-disciplines of mathematics, students will model phenomena in mathematical terms.

2. Using algebra, geometry, calculus and other track-appropriate sub-disciplines of mathematics, students will derive correct answers to challenging questions by applying the models from the previous Learning Outcome.

3. Students will write complete, grammatically and logically correct arguments to prove their conclusions.

These outcomes will be assessed on the final exam.

Textbook and WebAssign

The text for this course comes in several versions.


2. If you go on to do Calculus III (MATH 221) you will need the longer version, *Calculus: Early Transcendentals*, which adds six chapters.

3. Another option is the loose-leaf CofC custom edition, suitable for putting in a three-ring binder, which has the same contents as the longer version above, and is sold in the CofC bookstore bundled with WebAssign access. Since I also provide downloadable study guides for every section, it can be convenient to use this version and keep everything in one binder. Also, it is the least expensive option.

With any of these, you also need access to WebAssign, which can be got by purchasing a “bundled” edition, or by purchasing access separately through its website. You need to self-enroll at the WebAssign site http://www.webassign.net/ to do online homework and to access other resources there, like communication tools for getting my help on homework.

Exercises, Online Assignments, Quizzes, Class Exercises, Tests, and Final Exam

Study exercises  I will give a list of exercises to be done for each section covered. These are not for grading, but doing them is essential to success in this course: like learning a musical instrument or sport, success requires a lot of practice beyond what your teacher or coach sees and grades you on.

Online homework with WebAssign  There will be online homework assignments on each section, done with WebAssign, with about one week to work on each assignment from when the section is covered in class. WebAssign is a browser-based system that will let you make several attempts at each problem, including saving your work and coming back later to retry a problem after studying some more, or getting help from me. Thus I encourage you to start work on the assignment for each section as soon as we have covered it in class.
WebAssign, TEC and other graded homework exercises  Each section of the notes has a list of exercises from the corresponding section of the textbook. Some WebAssign homework must also be submitted on paper, because it involves sketching graphs or verbal explanations.

The text is supported by the Tools for Enriching Calculus website mentioned above, http://www.stewartcalculus.com/tec/. To use it, select our text (the early transcendentals version), and then select the chapter needed in menu Browse Homework Hints. The TEC exercises are also indicated in the textbook with a red, boxed number.

Quizzes and In-class exercises  On most Thursdays there will be either a quiz or an in-class exercise (or maybe both). Quizzes will be largely based on the recommended exercises. On the in-class exercises, you are encouraged to discuss amongst yourselves and to ask me questions, but each of you should write up and hand in your own version of the results.

Tests  There will be three in-class tests on Thursdays: see the list of important dates below. These will be partially cumulative: each will focus on material covered since the previous test, but some questions will rely on ideas and methods learned earlier in the semester. Mathematics is always like that!

There are no make-up tests. If you miss a test for a good, documented reason, the score can be replaced by your results on the corresponding part of the final exam. Such absences should be documented through The Office of the Associate Dean of Students: http://studentaffairs.cofc.edu/about/absence-memo/

If you have scheduling problems such as commitments to other official college activities, let me know soon, not just before a test date.

The Final Exam  will be on Friday May 5, noon–3 pm, probably in the normal classroom. The College does not allow final exams to be rescheduled except for clashes with other exams, so check your exam schedule before booking any flights home!

Participation Requirements

I do not usually take the roll in class but do require active participation in all the work described above. Students will be dropped for unexcused absence from any test or for unexcused failure to attempt any three assignments in WebAssign or in-class exercises. You are responsible for knowing what happens in each class including which sections have been covered, study exercises and assignments, information about test topics, and due dates. Thus you should contact me to explain any missed assignment or class, and more so any missed test.
Reading, Asking Questions, Office Hours and other Communication Options

Reading assignments will be given at the end of class. Classes will start with a few minutes for questions about recent readings, classes, homework exercises, or any related topics, but questions are welcomed at any time, not just at the start of class.

Office hours are to be arranged, but I will always available immediately after class and by appointment. Electronic communication is also useful: WebAssign has a nice system for requesting help on exercises and other messaging, and I will post notices there that you see at login.

Please email me soon at lemesurierb@cofc.edu from the account that you prefer to use, so that I can ensure that it is not rejected by the College’s vigorous junk mail filters and add it to my address book.

Grading Scheme

The combined scores for assignments and in-class work will count for 15% of the course total, each test will count for 20% and the final exam will count for the remaining 25% in the course total.

However, if the final exam score is better than the lowest test score, the exam score will carry a higher weight of 35% and the low test score only 10%.

The aggregate score guarantees at least the following letter grades:

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<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>90-100</td>
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<tr>
<td>A-</td>
<td>87-89</td>
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<tr>
<td>B+</td>
<td>84-86</td>
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<tr>
<td>B</td>
<td>80-83</td>
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<tr>
<td>B-</td>
<td>77-79</td>
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<tr>
<td>C+</td>
<td>74-76</td>
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<tr>
<td>C</td>
<td>70-73</td>
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<tr>
<td>C-</td>
<td>67-69</td>
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<tr>
<td>D+</td>
<td>64-66</td>
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<tr>
<td>D</td>
<td>60-63</td>
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<tr>
<td>D-</td>
<td>57-59</td>
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<tr>
<td>F</td>
<td>0-56</td>
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College of Charleston Honor Code and Academic Integrity

Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved.

Cases of suspected academic dishonesty will be reported directly to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XXF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student’s transcript for two years after which the student may petition for the XX to be expunged. The F is permanent. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board.

Students should be aware that unauthorized collaboration – working together without permission – is a form of cheating. Unless the instructor specifies that students can work together on an assignment, quiz and/or test, no collaboration during the completion of the assignment is permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information via a cell phone or computer), copying from others’ exams, fabricating data, and giving unauthorized assistance.

Students can find the complete Honor Code and all related processes in the Student Handbook at [http://studentaffairs.cofc.edu/honor-system/studenthandbook/](http://studentaffairs.cofc.edu/honor-system/studenthandbook/)
Accommodations for Students with Disabilities

If you have a documented disability, please contact me during the first two weeks of class or as soon as you have been approved to receive accommodations, so that reasonable accommodations can be arranged. Approval for such accommodations is arranged through the Center for Disability Services: see http://disabilityservices.cofc.edu/accommodations/

Some Important Dates and Times

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>Wednesday January 11</td>
<td>First day of classes</td>
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<tr>
<td>Monday January 18</td>
<td>Martin Luther King Day—no classes</td>
</tr>
<tr>
<td>Wednesday January 29</td>
<td>Last day to add/drop courses</td>
</tr>
<tr>
<td>Saturday February 4</td>
<td>Designated storm make-up day</td>
</tr>
<tr>
<td>Thursday February 9</td>
<td>Test 1</td>
</tr>
<tr>
<td>March 5–11</td>
<td>Spring Break—no classes</td>
</tr>
<tr>
<td>Thursday March 16</td>
<td>Test 2</td>
</tr>
<tr>
<td>Thursday March 23</td>
<td>Last day to withdraw with a grade of “W”</td>
</tr>
<tr>
<td>Thursday April 13</td>
<td>Test 3</td>
</tr>
<tr>
<td>Wednesday April 26</td>
<td>Last day of classes</td>
</tr>
<tr>
<td>Thursday April 27</td>
<td>Reading day/Designated storm make-up day</td>
</tr>
<tr>
<td>Friday May 5, noon–3 pm</td>
<td>Final Exam, probably in MYBK 223</td>
</tr>
<tr>
<td>Sunday May 7</td>
<td>Final grades available in MyCharleston, by 5pm</td>
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Topics and Sections Covered, and Study Exercises

We will cover all (or most) of Chapters 6, 7 and 11, and parts of Chapters 3, 8, 9 and 10, in the order below, which follows the grouping into three main topic areas described above.

In the exercises listed, an asterisk \( * \) denotes exercises on which WebAssign homework is based. The other exercises are for study, not grading, and there is help and solutions for those marked with \( T \) at the Tools for Enriching Calculus website http://www.stewartcalculus.com/tec/

I recommend that you review all exercises in each section covered, except where noted otherwise.

Dates for classes are estimates only: the last three class days are currently unscheduled, allowing us to decide to spend extra time on a few topics, so we will slip a bit behind this schedule as the semester proceeds.

Chapter 6 Applications of Integration

Section 1 Areas Between Curves [Wed. Jan. 11, Thu. Jan. 12]
- Review Examples 1, 2, 5, 6, and 7 in the text.
- Study Exercises 1, 3\( ^T \), 4\( ^* \), 5, 6\( ^* \), 9\( ^T \), 11\( ^T \), 13\( ^* \), 24\( ^* \), 33\( ^T \), 35.

- Review Examples 1–8 in the text.
- Study Exercises 7\( ^T \), 9\( ^T \), 11\( ^T \), 14\( ^* \), 18\( ^* \), 28\( ^* \), 41\( ^T \), 48\( ^* \), 50\( ^* \).
Review Examples 1, 2, and 4 in the text.
(Also 3 if you wish, but always try to avoid equation solving!)
Study Exercises 2*, 5T, 6, 13T, 18, 25T, 29T, 38*, 41T, 47T.

Study Exercises 4*, 7T, 9T, 13T, 14*, 17T.

Study Exercises 9T, 15T, 18*, 20*, 23, 30*, 37T, 42*, 43T.

Chapter 7 Techniques of Integration

Section 1 Integration by Parts [Wed. Jan. 25, Thu. Jan. 26]
Review all examples in the text.

Review Examples 1–4 and 7–9 of the text in particular.
Study Exercises 1*, 2*, 3T, 7T, 10*, 11T, 23T, 24*, 27T, 32*, 41T, 55T, 61T.

Section 3 Trigonometric Substitution (and Inverse Substitution) [Wed. Feb. 1, Thu. Feb. 2]
Study Exercises 2*, 3T, 4*, 7T, 12*, 13T, 16*, 17T, 22T, 26*, 31T.

Section 4 Integration of Rational Functions by Partial Fractions [Fri. Feb. 3, Mon. Feb. 6, Wed. Feb. 8]

Section 5 Strategy for Integration [Wed. Feb. 8]
Study Exercises 7, 17, 23, 31, 41, 45, 49, 57, 63, 71.

Test 1: Thursday February 9

Section 6 Integration Using Tables [Fri. Feb. 10]
Review Examples 1–4 of the text.
(We omit the topic Computer Algebra Systems, and thus Examples 5–7.)
Study Exercises 6*, 10*T, 14*, 17T, 18*, 19T, 26T, 29T, 31*T.

Section 7 Approximate Integration [Fri. Feb. 10, Mon. Feb. 13]
Review Examples 1–4, 6, and 7 of the text.
Study Exercises 1T, 3T, 10*.

Section 8 Improper Integrals [Wed. Feb. 15, Thu. Feb. 16]
Study Exercises 1T, 3*, 6T, 7T, 13T, 14*, 21T, 28*, 29T, 31T, 32*, 49T, 57T, 61T, 71T.

Chapter 11 Sequences and Series

Section 1 Sequences [Fri. Feb. 17, Mon. Feb. 20]
Study Exercises 1, 2, 5*, 9*, 16*, 17T, 23+T, 30*, 38*, 42T, 43T, 47*, 53T, 56*, 64T, 71T, 73T, 81T.

Section 2 Series [Sums of Infinite Sequences] [Wed. Feb. 22, Thu. Feb. 23]
Section 3 The Integral Test and Estimates of Sums [Thu. Feb. 23, Fri. Feb. 24]
Study Exercises \(7^T, 11^T, 14^*, 17^T, 21^T, 24^*, 37^*T\).

Section 4 The Comparison Tests [Fri. Feb. 24, Wed. Mar. 1]
Study Exercises \(1^T, 2^*, 5^T, 7^T, 17^T, 18^*, 20^*, 28^*, 31^*T, 37^T\).

Section 5 Alternating Series [Wed. Mar. 1, Thu. Mar. 2]
Study Exercises \(2^*, 3^T, 7^T, 11^T, 14^*, 17^T, 23^T, 24^*, 32^T\).

Study Exercises \(1^*, 2^*, 4^*, 7^T, 8^*, 10^*, 13^T, 14^*, 17^T, 18^*, 24^*, 39^T, 40^*, 43^T, 45^T\).

The WebAssign Exercises are 8, 10, 14, 18, 26: also work a selection of others.

Test 2: Thursday March 16

Section 8 Power Series [Fri. Mar. 17, Mon. Mar. 20]
Study Exercises \(4^*, 5^T, 6^*, 7^*T, 10^*, 15^*T, 23^*T, 24^T, 29^T, 30, 37^T\).

Section 9 Representation of Functions as Power Series [Mon. Mar. 20, Wed. Mar. 22]
Study Exercises \(3^*, 5^T, 8^*T, 13^T, 15^*T, 16^*, 23^T, 25^*T, 32^*, 35^T\).


Section 11 Applications of Taylor Polynomials (selected topics) [Wed. Mar. 29, Thu. Mar. 30]
Review Examples 1 and 2 in the text.
Study Exercises \(5^T, 9^T, 18^T, 19^T, 25^T, 31^T\).

Chapter 8 Further Applications of Integration

Section 1 Arc Length [Thu. Mar. 30, Fri. Mar. 31]
Review all examples in the text.
Study Exercises \(2^*, 9^T, 13^T, 15^T, 16^*, 22^*, 33^T, 35^T\).

Chapter 10 Parametric Equations and Polar Coordinates

Section 1 Curves Defined by Parametric Equations [Mon. Apr. 3, Wed. Apr. 5]

Section 2 Calculus with Parametric Curves [Thu. Apr. 6, Fri. Apr. 7]
Review Examples 1–5 in the text.
Study Exercises \(5^T, 11^T, 23^T, 31^T, 41^T, 45^T\).

Section 3 Polar Coordinates [Mon. Apr. 10, Wed. Apr. 12]
Review Examples 1–9 in the text.
Study Exercises \(8^*, 11^T, 25^T, 39^*, 32^*, 33^T, 42^*, 47^T, 57^T, 58^*, 61^T, 64^*\).

Test 3: Thursday April 13
Section 4  Areas and Lengths in Polar Coordinates [Fri. Apr. 14, Mon. Apr. 17]
  Review Examples 1, 2, and 4 in the text.
  Study Exercises $2^\ast, 10^\ast, 24^\ast, 27^T, 31^T, 47^T, 50^\ast$.

Chapter 9  Differential Equations (topic choices depending on time available)
  
  Section 1  Modeling With Differential Equations [Mon. Apr. 17, Wed. Apr. 19]
  Study Exercises $3^xT, 6^\ast, 7^T, 9^xT$, and $10^\ast$.

  Section 3  Separable Equations [Wed. Apr. 19, Thu. Apr. 20]
  Review Examples 1–3 in the text. (Physics students: also look at Example 4.)
  Study Exercises $4^\ast, 10^xT, 13^xT, 16^\ast, 25^T, 38^\ast$.

  Section 5  Linear Equations [Fri. Apr. 21, Mon. Apr. 24]
  Review examples 1–3 in the text. (Physics students: see also Examples 4 & 5.)
  Study Exercises $6^\ast, 7^T, 9^T, 16^\ast, 19^T, 20^\ast$.

Final Exam: Friday May 5, noon–3pm.