Math 221 – Calculus & Analytic Geometry 3

Fall 2022 Course Syllabus

James Jones, Professor of Mathematics
Mathematics, Science, and Business Division – Richland Community College

Course Meeting Information

The Fall 2022 semester begins August 15 and ends December 9.

Section 01 meets from 10:30 to 11:40 am on Monday, Wednesday, and Friday in room W249.

Here are some important dates.

- August 25 is the last day to withdraw and get a refund.
- December 2 is the last day to withdraw from the course without receiving a letter grade.
- The comprehensive final exam is Monday, December 5, from 10:00 to 11:50 am.
- No late work will be accepted after December 7.

This is a face-to-face course that uses the Canvas learning management system. There is an online student orientation to Canvas and the College that must be completed prior to obtaining access to your courses in Canvas.

We will be using Edfinity system for homework. Access to Edfinity is through Canvas.

Submitting assignments in Canvas or Edfinity does not count as attending class. Assignments will be due throughout the week and, per federal guidelines, you should expect to dedicate a minimum of 12 hours per week to this course.

Instructor Information

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The best way to contact the instructor is through Canvas or by email. Do not leave a voice mail as it will not reach the instructor in time to help.

I spend most of my office hours in the classroom before and after class. This allows me to help students with their assignments, homework, projects, exams, and questions. Students are encouraged to come to class early each day and use that time to ask questions of the instructor, work on projects, or just socialize with other students in the course.

These office hours are on Monday, Wednesday, and Friday.

8:45–9:00 am, 10:10–10:30 am, 1:25–1:45 pm, 3:10–3:30 pm, 4:40–4:55 pm (MW only)

Text

There is a textbook and an electronic homework package required for this course.

The textbook is available as a free PDF download and you do not have to buy a printed textbook. The electronic version of the *APEX Calculus Version 4.0* textbook can be downloaded from http://www.apexcalculus.com/downloads. There is a multi-volume edition that contains all three semesters of calculus or volumes for the individual courses.

The Edfinity homework system is required. You must log into Canvas and access Edfinity from there.

- *APEX Calculus 3 (APEX Calculus v4.0) (Volume 3)*. Gregory Hartman. Copyright 2018. ISBN-13:978-1719263665. Printed textbook is optional.
- *Edfinity homework and testing platform*. Required. 5 months access can be purchased in-app for $29 or through the college bookstore.

Student Audience

Transfer students. Students pursuing degrees in engineering, mathematics, life sciences.

Prerequisite

Successful completion (C or better grade) of Math 122, Calculus and Analytic Geometry II.

Course Description

MATH 221 - Calculus and Analytic Geometry 3
Hours: 4 lecture - 0 lab - 4 credit

MATH 221 is a standard multivariable calculus course intended for students going into areas of science, technology, engineering, or mathematics. Topics covered include three-dimensional space, vectors and their operations, vector-valued functions, arc length, and curvature; partial derivatives with applications, tangent planes, directional derivatives, gradients, and optimization problems; multiple integrals with applications in rectangular, polar, cylindrical, and spherical coordinates systems. The course concludes with vector calculus, line integrals, parametric surfaces, and their applications.

Applicable toward graduation where program structure permits.

- Certificate or degree: All certificates and all degrees.
- Group requirement: Mathematics
- Area of Concentration: Not applicable.

Illinois Articulation Initiative (IAI)

The mathematics component of general education focuses on quantitative reasoning to provide a base for developing a quantitatively literate college graduate. Every college graduate should be able to apply simple mathematical methods to the solution of real-world problems. A quantitatively literate college graduate should be able to:

- interpret mathematical models such as formulas, graphs, tables, and schematics, and draw inferences from them;
- represent mathematical information symbolically, visually, numerically, and verbally;
- use arithmetic, algebraic, geometric, and statistical methods to solve problems;
- estimate and check answers to mathematical problems in order to determine reasonableness, identify alternatives, and select optimal results; and
- recognize the limitations of mathematical and statistical models.

Courses accepted in fulfilling the general education mathematics requirement emphasize the development of the student's capability to do mathematical reasoning and problem solving in settings the college graduate may encounter in the future. General education mathematics courses should not lead simply to an appreciation of the place of mathematics in society, nor should they be merely mechanical or computational in character. To accomplish this purpose, students should have at least one course at the lower-division level that emphasizes the foundations of quantitative literacy and, preferably, a second course that solidifies and deepens this foundation to enable the student to internalize these habits of thought.

Math 221, Calculus & Analytic Geometry 3, satisfies the Illinois Articulation Initiative Definition of a General Education Mathematics Course. It corresponds to M1900-3, College-level Calculus III. This course description also matches Math Majors course description for MTH 901: Calculus III.

The IAI description for Calculus involves all three semesters since some schools cover the sequence in a different order. The portion of the Calculus sequence that is covered in Richland's Calculus 3 is *highlighted in red italics*.

M1 900-3: College-level Calculus III **MTH 903: Calculus III**

Topics include (but are not limited to) the following: limits and continuity; definition of derivative: rate of change, slope; derivatives of polynomial and rational functions; the chain rule; implicit differentials; approximation by differentials; higher order derivatives; Rolle's Theorem: mean value theorem; applications of the derivative; anti-derivative; the definite integral; the fundamental theorem of calculus; area, volume, other applications of the integral; the calculus of the trigonometric and inverse trigonometric functions; logarithmic and exponential functions; techniques of integration, including numerical methods; indeterminate forms: L'Hôpital's rule; improper integrals; sequences and series, convergence tests, Taylor

series; *functions of more than one variable, partial derivatives; the differential, directional derivatives, gradients; double and triple integrals: evaluation and applications*. Prerequisite for Calculus III: Calculus II or equivalent of C or better.

When three courses are required to convey the necessary skills in calculus to mathematics majors, it is highly advised that students complete the entire sequence at a single institution. Course content may vary widely among institutions depending on the credits assigned to each course, and completing the sequence at a single institution is the best way to assure that neither credit nor content is lost in transfer.

For more information on the Illinois Articulation Initiative, visit their website at http://www.itransfer.org/

Topical Outline

A weekly calendar listing the specific material covered each week is provided at the end of this syllabus. This section is provided as a broad overview of the major topics covered.

This course does not run on calendar weeks and any attempt to coerce the calendar into a weekly schedule necessarily introduces some approximation. For example, an exam may be in a different week than the weekly heading suggests or a chapter may begin midweek.

The official calendar that the students receive is a one page, 16 week, daily calendar. This calendar lists the section from the textbook being covered each day and the dates that major assessments are due. Due dates will also be listed in the Canvas learning management system.

- Vectors – 3 weeks
- Vector Valued Functions– 3 weeks
- Functions of Several Variables – 3 weeks
- Multiple Integration – 4 weeks
- Vector Analysis – 3 weeks

General Course Objectives

A topical outline of the content covered in the course follows this section.

Specific Course Objectives

Upon completion of this course, the student should be able to

- convert between rectangular, spherical, and cylindrical coordinate systems
- find dot products, cross products, and projections using vectors
- form and work with parametric equations of lines
- distinguish the forms of the quadric surfaces
- differentiate and integrate vector valued functions

- find the arc length of a vector valued function
- find the unit tangent, normal, and binormal vectors
- determine the limits of a multi-variable function
- find partial derivatives
- use the chain rule for derivatives with multi-variable functions
- determine directional derivatives and apply the gradient
- find the maximum and minimum of a multi-variable function, identify saddle values
- use the method of Lagrange multipliers to determine the extrema of a multi-variable function
- set up the regions and integrate double integrals in rectangular and polar coordinates
- set up and evaluate triple integrals in rectangular, cylindrical, and spherical coordinates
- use the Jacobian to change variables to ease integration
- find the divergence and curl
- evaluate line integrals
- determine whether a vector field is conservative and use Green's theorem
- find surface integrals
- apply Stoke's theorem

General Objectives

While learning calculus is certainly one of the goals of this course, it is not the only objective. Upon completion of this course, the student should be able to

- demonstrate comprehension and understanding in the topics of the course through symbolic, numeric, and graphic methods.[1, 2, 4]
- demonstrate the use of proper mathematical notation.[1, 2]
- use technology when appropriate and know the limitations of technology.[1, 2, 3, 4]
- work with others towards the completion of a common goal.[1, 2, 3, 4]
- use deductive reasoning and critical thinking to solve problems.[4]
- apply common sense to mathematical problems.[4]
- effectively communicate the student's understanding of the subject.[1, 2]

The numbered superscripts refer to the Richland Cross-Disciplinary Outcomes addressed by that objective.

Richland Cross-Disciplinary Outcomes

Richland Community College has established some outcomes for degree-seeking students. These are not necessarily completed within a single course, but should be demonstrated and assessed at some point before the student graduates. Richland may utilize anonymous student work samples for outcomes assessment and continuous improvement of courses and programs.

Richland Community College's cross-disciplinary outcomes are:

1. The degree-seeking student will communicate effectively in writing.
2. The degree-seeking student will orally communicate effectively.
3. The degree-seeking student will access, evaluate, and appropriately use information in research and applied contexts.
4. The degree-seeking student will think critically and creatively.

Program Outcomes

In addition to the cross-disciplinary outcomes, the mathematics program at Richland Community College has established some discipline-specific outcomes and goals.

- **Mathematical Reasoning**: Students will apply mathematical reasoning to solve story problems. This goal influences the course, but is not measured directly.
- **Preparatory Skills**: Students will demonstrate mathematical competencies needed for success in other courses. This goal influences the course, but is not measured directly.

Course Expectations

Student Expectations of Instructor

Here are some things you can expect from the instructor.

- Responses to email or Canvas messages will occur in a timely manner. The goal is within 12 hours during the week and within 36 hours over the weekend. At times, you will find the instructor at the computer and have a response to simple questions within 15 minutes. That is not, by any means, a guaranteed response time, but don't be surprised if it happens. I do not have a smartphone and am not connected to email 24-7. I do take my laptop with me while traveling, but sometimes hotel internet is flaky. In other words, don't wait until something is due to ask about it. When the problem is too difficult to answer within 12 hours, the instructor will send you a message notifying that it will take longer.
- Assignments will be graded within 3 days of submission. Exams may take longer and the instructor may withhold release of exam grades until all students have completed their exams.
- The instructor will provide guidance and direction on assignments, but will usually steer the student towards the answer rather than just providing the correct answer. Understanding the problem and process is more important than just getting the answer.
- When the instructor makes a mistake, he will admit it and not blame Canvas or other technology for his mistakes. Be aware that the explanation of the mistake may include his frustration with the technology, but he will accept blame if it is really is his mistake. If the mistake warrants, adjustments may be made.
- The instructor will treat students with civility and respect.

Instructor Expectations of Student

Here is what is expected out of students in this course.

- Students will communicate with the instructor. Life-events happen, but the instructor needs to know about them as soon as possible when they are going to interfere with learning. Do not just disappear from the course for a while.
- Students will be civil and respectful of all persons in the course.
- Students will monitor Canvas and their student emails and respond to the instructor or other classmates in a timely fashion.
- If a student contacts the instructor for help and then figures it out before the instructor has a chance to respond, the student will notify the instructor that the problem has been resolved or that help in a different area is needed.
- Students will read the book, watch the videos, and read the material in Canvas before contacting the instructor for help. Many of the questions that students have are already answered in the online material and you can find them faster yourself than you can by contacting the instructor and waiting for a response.
- When a student contacts the instructor for help, the student should be prepared to show what has been attempted or already accomplished. If emailing, the student should be specific in his or her requests. Do not send a request for help that just says, for example, "I don't understand derivatives," and expect help by email. That is too large of a topic and it is usually just one sticking point that is difficult to self-identify when you don't understand the material. You should meet with the instructor in person in that situation.
- Students will be academically honest in their work. Among other things, this means that you will complete your own homework and take your own exams. You are welcome to receive help on homework, projects, and discussions, but the exams need to be yours. You may use a calculator on all exams unless otherwise indicated.
- Students will seek help if there are technology issues.

Type of Instruction

Instruction may occur through classroom lecture, lecture notes, online videos, discussions, problem solving, student questions, student participation, quizzing, and examples.

Method of Evaluation

Evaluation could include any of the following: problem solving exams, objective exams, essays, research papers, oral presentations, individual and group projects, quizzes, classroom activities, engagement, and homework.

The official gradebook for the class is inside Canvas.

A schedule will be given to the class that is designed to help spread things out and set a pace

for you. You may work ahead of the schedule provided to the class and this is encouraged. If you need extra time, you can take it as long as you keep in communication with the instructor.

Reading Quizzes – 10% of grade

The first step in any section should be to learn the material by reading the book and the lecture notes inside Canvas. Students often go straight to the homework and then struggle because they have not looked at the material. If students get problems correct in the homework, they may never look at the material the instructor presents and miss out on important connections, shortcuts, and desired skills.

There is a reading quiz inside Canvas for each section of the textbook. They are timed and you have 10 minutes to complete each one. You will not have time to look up everything on the quiz if you have not already become familiar with the section.

The quizzes are due five (5) minutes before class begins on the day a section is scheduled to begin. You may take a quiz up to one week early, but they close when they are due and cannot be made up if missed.

The answers are available as soon as you complete the quiz. Please do not share them with other students who have not completed the quiz. This may change if it becomes too big of a problem.

The reading quizzes cannot be made up if missed, but the lowest reading quiz score from each unit (exam) will be dropped.

Homework – 20% of grade

Homework Philosophy

Homework is the practice that helps refine and solidify the skills and understanding. You cannot fully understand the material by watching someone else do it, you need to practice it. The more you practice, the better you become.

There are many resources online that will provide answers and even work to calculus questions. It is tempting to go to the websites and copy down the answers and get 100% of the homework correct. When it comes test time, students look at the homework, see that they had 100% on each section, and think they know the material. They forget that it took them 12 attempts and they found a video on YouTube where someone worked out the exact problem and they just copied the answer down.

Don't take shortcuts. Take the extra time to do it correctly. Write down the original problem. Make notes when you struggle that identify the issue and how you solved it.

Students also think that if they can do every problem of homework, they know all of the

material in the section. There are often concepts covered in the material that are not in the homework. Some concepts are too hard to put into homework that can be automatically graded. Your book has also opted to put in a limited number of homework problems rather than a more traditional calculus textbook that may have around 75 problems per section. Some of the important concepts were left out of the homework in the process.

Online homework systems often check just the answer and not the work. They have no idea if you used the right methods or just asked your calculator for the answer. Mathematics is about the journey, not just about arriving at the destination. How you get your answer is arguably more important than getting an answer.

This is why I will want you to submit your written work on paper. This is why work may be required for exams.

Homework Instructions

Homework will be delivered and assessed using the Edfinity system. Edfinity is a front-end to the WeBWorK system sponsored by the Mathematical Association of America (MAA) and the National Science Foundation (NSF). You will access Edfinity through Canvas, do not go to Edfinity directly. Homework is a formative assessment. It is designed to help you learn the material, but the learning doesn't really occur within Edfinity. Edfinity is the place where you demonstrate and check your learning.

A typical workflow is that you look at the section and taking the reading quiz before you come to class. In class, you hear the lecture, see the examples, ask questions. After class, you work on the homework.

Homework is due the day after we finish the section (see the course calender for a lecture schedule). If we finish a section on Monday, then the homework for that section is due on Tuesday. This pattern holds regardless of whether the day after is a holiday or not.

Homework will be accepted up to 7 days late, but there will be a 10% reduction in the points for late work.

Each single part question is worth 1 point, each multi-part problem is worth 2 points regardless of how many parts there are. Homework is untimed although it will automatically submit on the due date.

Many of the problems allow for hints and practice of similar problems.

You may work ahead of the suggested schedule, but absolutely no late work will be accepted after December 7.

You get four (4) attempts per question on homework. The best score on any of the attempts is kept. Experience has shown that students just start guessing at some point rather than taking

the time to learn what they are doing wrong. Multiple choice items only allow 2 choices.

You may attempt the entire assignment up to three (3) times. Students don't really use this option as they are ready to move on after completing it just once. However, if you have completed the entire assignment and think you can do better, this allows you to retake the entire assignment (not individual questions). Your best score is kept on any of the attempts.

Written Work

Edfinity only accepts your final answer, it does not receive or consider any of the work that it took to get there. If you make a simple arithmetic or algebra mistake, Edfinity counts the problem wrong. If you have no clue what you are doing, but find the answer online or happen to guess lucky and get the right answer, you get full credit. Neither of these are the desired outcome for long term success.

The written work for your homework will be collected and examined by the instructor. The instructor will not be looking at the homework to change the score from Edfinity, but to provide suggestions on ways that you can improve your understanding. The instructor is looking at things such as organization, clarity, completeness, originality, corrections, and understanding.

Here are the desired outcomes.

- Each section of homework begins on a separate page with the student's name, section number, and point total from Edfinity at the top. Each additional page should contain at least the section number at the top.
- Each problem is clearly identified. Problems do not need to be in the order they were presented in Edfinity, but it should be clear which problem you're working. If you do not work your problems in consecutive order, then you may want to identify the problems you can find at the top of each page.
- For simple problems, the original problem is copied down. Students have a tendency to just write the answer and that provides no help to you when you go back later to look at your notes to study because you do not know what the problem was.
- For story problems, a brief description of the problem is sufficient (example, "minimize the distance") and then write down the key aspects of the problem. If pictures are helpful, then they should be included in your notes.
- Only write in a single column and write top to bottom. Do not snake a problem around trying to minimize the amount of paper used. Trying to cram all of the work onto a single page leads to disorganization and makes it difficult to follow. Problems that start on the left side, work down and then continue on the right side of the page are hard to follow as well.
- It should be obvious what your final answer is. It does not have to be circled or boxed, especially if it is the last thing written on the problem. If it isn't the last thing, then highlight,

circle, or box it. If you do a check of your answer, then clearly identify that you are checking the work (writing "check:" in front of it is a good indicator). If your answer is in the middle of the work because your work is all over the place, then see the previous item about writing in a single column.

- Draw a line through any mistakes, do not erase them. If there is room (remember you're only using one column), make the correction there. If you begin a problem over from scratch, you may use an X through the original problem (do not scribble it out) but you should still identify what went wrong. Students think that their work needs to be perfect. When you erase your mistakes, you forget what it was that caused them in the first place. By drawing lines through mistakes and making a note about what the problem was (arithmetic, algebra, trigonometry), you can start to see recurring patterns and then be on the lookout for those mistakes in the future. If you erase the mistakes, all of that is lost; students think "I got 100% on the homework so I understand this" and forget about the having to use all four attempts in Edfinity to get it right. When students turn in homework with no mistakes and corrections, instructors suspect the student may just be copying work from an online homework site rather than doing the work themselves and that is bad for understanding.
- Indicate the eventual correctness of each problem with a checkmark or x-mark. For questions that you were unable to figure out, annotate what parts you are certain about, where your confidence wanes, where you are completely lost, etc. These are good questions to get help with and having an idea of where the problem lies can save the person helping you.
- When you encounter something tricky or new, or need an identity you don't have memorized, then write down an explanation. For example, if you use a half-angle identity for $\cos^2 x$ and didn't have it memorized, identify and write it down the formula (this is a good use for all that space you have available since you're only writing in one column). At some point, you will know it from memory and it won't be necessary to write it down anymore.
- When you have to get additional help in working a problem, identify where you got it from. Was it from the book? Was it from the instructor's notes in Canvas? Was it using OfficeHours or practicing a similar problem in Edfinity? Was it from Khan Academy or Delta Math? Did you use a homework resource site like Chegg or Slader? Was it a YouTube video? Getting help is not bad, but doing it for the majority of the problems can be an indication that you are not understanding the material or that you are lacking prerequisite skills. Listing when and where you struggle can help identify good resources and provide insight when additional help is needed.
- The work is original. Do not just copy solutions from manuals or websites. A major clue you've done this is when the work matches nothing we've done in class or in the book.

These guidelines are to help you be successful. In college, we tend to focus on the content and

expect that students already know how to be successful. What we're seeing more of is that students were never taught how to study or do homework. When they come to the instructor for help, they have no useful work to show.

At the beginning of the semester, these suggestions may seem like a lot of extra work because they are foreign to you, especially if you are used to having answers come naturally. I expect that as the semester progresses, this will become easier and easier for you and the benefits of doing homework well, as opposed to just doing homework, will start to show through. This will also help when it comes time for the exams and work will be part of your grade.

If you consider the guidelines above as the requirements, then each section of homework will be scored according to the following holistic rubric.

Rating	Score	Description
Awesome	105%	Exceptional job that really impresses the teacher
Good	90%	Beyond what was required
Okay	75%	Satisfactory completion of requirements
Fair	60%	Almost there, but needs some development
Poor	45%	Minimal attempt at meeting requirements
None	0%	Did not participate or submission nowhere close to expectations

Each of the sections for a unit (exam) will be combined into a single assignment in the gradebook. Each section will be worth 2 points, so that if there are five sections covered for the exam, then it will be a 10 point assignment. The assignment will be included with the Edfinity homework assignments for that unit.

One homework score per unit will dropped, so if you choose not to do this, it will not directly affect your grade. However, choosing to do this will indirectly lead to higher scores on the other homework assignments and on the exams.

Your written work for each section should be given to the instructor after you have completed the Edfinity work. You have up to 8 days after we finish a section to complete the homework in Edfinity, so the written homework will be accepted up to two (2) weeks after we finish a section. Please don't take that long, though, as the idea is that you will use the feedback to improve. Absolutely no late work will be accepted after December 7.

Exams – 60% of grade

Exams will be administered in a proctored setting in the classroom using paper and pencil.

Exams will focus on the concepts rather than the calculations. The questions will not be a mere repetition of homework problems and most of the problems on the exam will not look like homework problems. They will focus on numeric and graphical interpretations rather than

problems that just need a number. This is another reason why it is important to learn the material, not just the few problems you're asked to do for homework.

There are exams over the chapters and a comprehensive final exam. The final chapter does not have a separate exam but will compose a major component of the comprehensive final exam. The final exam counts as two regular chapter exams.

Most exam questions will focus on concepts and require work to be shown. Those questions will be graded using a holistic rubric.

Rating	Score	Description
Awesome	105%	Correct answer with sufficient work
Good	90%	Correct answer without work, only transcription errors
Okay	75%	Wrong answer, mathematical but not conceptual errors
Fair	60%	Few conceptual errors, but on the right track
Poor	45%	Major conceptual errors, but has some idea of solution
None	0%	Did not answer, answer or work completely wrong

The rubric is a guideline, but there is some fluidity. The point is that to get full credit (extra credit) you will need to show work. If you copied something wrong but did everything else right, then you can still end up with a good. On the other hand, if your work is completely wrong but you happened to guess correctly, you may not get any points.

Some questions will be more skills oriented and not require a lot of work but may contain multiple parts. The rubric does not apply to questions like that and so the percentage of correct questions will be used to find the closest rating from the rubric.

Other – 10% of grade

This is a catch-all category for everything else that we do in the course. It may include discussions, projects, quizzes, activities, or any other assignments besides reading quizzes, homework, and exams.

Grading Policy

Letter grades will be assigned to final adjusted scores as follows:

A: 90-100% B: 80 - 89% C: 70-79% D: 60-69% F: below 60%

Final scores will be rounded to the nearest integer, so an 89.5% will be considered an "A".

All grading are subject to audit and revision if mistakes are found.

Consideration may be given to such qualities as attendance, class participation, attentiveness, attitude in class, and cooperation to produce the maximum learning situation for everyone.

The gradebook for the course will be kept inside Canvas. When you look at your grades in Canvas, there may be a + or – after the letter grade (example, B+ or C–). The plus or minus after the letter grade is informational and intended to be used as an encouragement or a warning that you might be able to move up or that you are in danger of slipping down. However, the final grades in the course will not contain a + or a –, just the letter grade, and an 80.1% is as much of a B as an 88.7% is.

If you are concerned about your grades, see the instructor.

Extra Credit

Some extra credit is built into assignments. There are no separate extra credit assignments.

- Exams may earn up to 5% extra credit if you get the questions correct and show sufficient work. Since exams are worth 60% of the grade, this will allow up to 3% extra credit overall.
- Written work for homework may earn up to 5% extra credit per assignment. Because each unit has a different number of sections and the lowest grade that is dropped varies by student, it is impossible to give an exact value here. A reasonable approximation is that there might be a potential for an overall 0.14% extra credit from the written homework.

Combined, a student might have the potential to earn up to 3.14% extra credit for the course.

Late Work

- Edfinity Homework may be turned in up to one week late, but there will be a 10% penalty.
- Written work for the homework may be turned in up to 2 weeks after we finish a section. There is no penalty for being late.
- No late work will be accepted after December 7.

Attendance / Engagement Policy

Regular attendance and participation is essential for satisfactory completion of this course. You need to be actively involved in this course several times a week.

You need to regularly monitor your Canvas inbox and Richland email for notifications and information.

Students who do not communicate with the instructor and have irregular or infrequent attendance, miss the first day of class, or miss any two consecutive days may be dropped.

Students who, because of excessive absences, cannot complete the course successfully, are required to be administratively dropped from the class at midterm. If a student stops attending after midterm, it is the student's responsibility to withdraw to avoid an "F". Do not stop participating and assume that you will be withdrawn from the class by the instructor.

Although dropping students for non-attendance at midterm is required, students whose

participation in the course is occasional or sporadic may be dropped from the class at any point during the semester at the instructor's discretion. The safest way to make sure you're not dropped for non-attendance is to continue to actively participate in the course.

The student is responsible for all assignments, changes in assignments, or other information given in the course. Regularly and frequently monitor your communications for updates or changes, but communicate with your classmates to get notes and other information.

Time Requirements

In 34 CFR 600.2, the federal government requires that the amount of student work for a credit hour reasonably approximates not less than one hour of class and two hours of out-of-class work per week for each semester hour. That is, there are three (3) hours of material per week for each credit hour.

Students taking a four (4) credit hour course (Math 122 and Math 221) should expect to spend a minimum of 12 hours per week on this course. Students taking a five (5) credit hour course (Math 121) should expect to spend a minimum of 15 hours per week on this course.

If you are taking 15 credit hours, then you should expect to spend at least 45 hours a week on course work. That is the equivalent of a full-time job. The government considers that if you are taking 15 credit hours, then being a student is your full-time job.

According to the federal regulations, this target is a minimum, not an average.

Failure of the course to meet these time requirements could result in loss of program integrity, forcing the college to recover federal financial aid, and ultimately loss of accreditation.

At face value, it sounds overwhelming and impossible, but the time includes reading the book, watching videos, working on homework and projects, and participating in discussions.

The point is to manage your time effectively so that you don't feel the course is overwhelming.

Technology

The use of technology in this course is consistent with the Technology Statement in the Illinois Mathematics & Computer Science Articulation Guide (IMACC, 2019, p. 2). Technology is used to enhance the learning of Calculus, but it is not the focus of the instruction. There will be instances when we will use the calculator or computer to aid in our understanding or remove some of the tediousness of the calculations (especially in the area of numerical approximations). There may be some projects, homework, or portions of a test that require you to use technology to complete.

Here are some of the technology tools that we may use.

Canvas

The Canvas learning management system holds the online presence for this course. You will need to complete the student orientation to Canvas before you can gain access to the course.

Edfinity

Edfinity is an online homework and testing platform. You must log into Canvas in order to access Edfinity.

Calculator

This class is a mathematics class and a graphing calculator is required. A scientific calculator is not sufficient. The calculator should be capable of graphing functions, finding roots, maximums, and minimums from a graph, displaying tables of values, and finding the definite integral numerically. A Texas Instruments TI-84 or TI 83 is the recommended calculator. That said, a TI-92, TI-89, or TI Nspire CAS calculator is recommended for this course if you plan on taking additional calculus or engineering courses.

You may use a graphing calculator from another company like Casio, but you will be responsible for figuring out how to use it.

Calculators may be used to do homework and may be used on exams and/or quizzes in class unless otherwise announced.

Microsoft Excel

This spreadsheet application is useful for numerical methods such as Newton's Method, the Trapezoid Rule, Simpson's Rule, and Euler's Method.

Microsoft Excel is part of Microsoft Office, which is loaded on all of the student computers at Richland.

Current Richland students can obtain Microsoft Office without additional charge as part of the Microsoft Student Advantage program. Log in to https://office.com using your Richland email and password and choose Install Office.

Maxima

Maxima is an open-source computer algebra system that is free for you to download and use at home. It is available for Windows, Mac, Linux, and Android at http://maxima.sourceforge.net/

WinPlot

WinPlot is a free graphing software package for Windows written by the late Rick Parris at Phillips Exeter Academy in Exeter, New Hampshire. The software is useful for creating graphs and it is easy to copy/paste the graphs into other applications. Exeter Academy maintained the

server with the software for about 4 years after Parris' death, but the site is no longer available. To download the software, visit the instructor's Mathematical Software page at https://people.richland.edu/james/software

DPGraph

DPGraph is a 3D graphing package, written by David Parker, that will be useful for visualizing the graphs of multi-variable functions. The software is not free, but Richland has a site license that allows students to download and use it without additional charge. You may download it from http://www.dpgraph.com/graphing-users.html (be sure to find the entry for Richland Community College)

CalcPlot3D

This is an online 3D graphing calculator JavaScript applet written by Paul Seeburger at Monroe Community College in Rochester, NY. It allows you to visualize vectors, space curves, surfaces, normal lines, tangent planes, and contour plots. It is available online at https://c3d.libretexts.org/CalcPlot3D/index.html

Google Drive

Google Drive (formerly Google Docs) is a multi-user office suite that has word processing, spreadsheets, drawings, and presentation capabilities. We will use this for collaborating on our technology projects. It works best if you have Gmail account. It is available at https://drive.google.com although it is easily accessed from your Gmail account.

Additional Supplies

The student should have access to a pencil, paper, and calculator each day. You may occasionally want a ruler or graph paper.

Additional Help

The student is encouraged to seek additional help when the material is not comprehended. Mathematics is a cumulative subject; therefore, getting behind is a very difficult situation for the student. There are several places where you can seek additional help in your classes.

Some services provide a phone number or extension. When only an extension is provided, you will need to first call the main phone number at 217-875-7211.

Instructor

I try to make myself as available to the students as I can. My office hours are listed at the beginning of this syllabus, but those are just the times I'm scheduled to be available to the students. Grab me and ask me questions if you see me in the hallway. Ask questions before or after class. If I'm in my office and it's not my scheduled office hours, go ahead and stop in.

The instructor should be considered the authoritative source for material related to this class. If a tutor or other student says something that disagrees with the instructor, believe the instructor.

Study Groups

Probably the best thing you can do for outside help is to form a study group with other students in your class. Work with those students and hold them accountable. You will understand things much better if you explain it to someone else and study groups will also keep you focused, involved, and current in the course.

Mathematics Enrichment Center

The Mathematics Enrichment Center, room S102, provides free walk-in tutoring for mathematics courses. They also provide help with study skills and preparation for taking the mathematics placement test.

Contact tutoring@richland.edu for more information.

Testing Center

The testing center is located in room N114. You may be required to use the testing center if you miss an in-class exam or if an online exam needs proctored.

You must provide a photo identification and know the name of your instructor to use the service.

Academic Success Center

The Academic Success Center consolidates several student services into one area. It is located in room S134.

Tutoring

The tutoring center provides tutoring on a walk-in or appointment basis in room S134.

Students seeking mathematics tutoring should visit the Mathematics Enrichment Center in room S102. Evening and weekend tutoring is available via NetTutor inside Canvas. For the current tutoring schedule and study resources, visit https://richland.instructure.com/courses/1830817

Accommodations

The Accommodations Office is located in room S134 and provides support to students with documented physical, psychiatric, or learning disabilities. Students needing accommodation services should visit https://www.richland.edu/accommodations or contact accom@richland.edu as early in the semester as possible.

If you request an accommodation, you will be required to provide documentation that you need that accommodation and the instructor will be unable to provide the accommodation until the notified of the accommodations by the Accommodations Office.

Students who have approved accommodations should contact their instructor to discussion the implementation of the accommodations for the course.

Student Tech Support

The Student Tech Support help desk is located inside the Teaching and Learning Center. They provide technical support for students including answering questions about Canvas, myRichland, e-mail, cell phones, tablets, and laptops. They can also help troubleshoot your computer issues and make sure your computer is ready for course work.

They are located in room W202, but the best way to contact them is electronically.

For Canvas-related issues, use the "Help" link in the lower-left corner of Canvas and select Report a problem.

For non-Canvas related issues, email student.tech@richland.edu or visit https://www.richland.edu/academics/tlc/student-tech-support/

Open Computer Labs

Students often wish to know where, besides the classroom, they can go to use the software. There are computers located in the Learning Resources Center and in the Academic Success Center that you may use.

Microsoft Office Student Advantage

Currently enrolled students in credit courses may download and install the Microsoft Office software on their personal Mac or Windows devices at no additional cost. To install the software, visit https://office.com, log in using your Richland email address and NetID password, and choose "Install Software."

For questions or assistance with Microsoft Office, contact Student Tech Support by email at student.tech@richland.edu, at extension 6376, or in person at the Teaching and Learning Center in room W202.

Richland Thrive

Richland Thrive is an implementation of an early-alert identification and intervention system powered by the Hobsons' Starfish software. The software is designed to help students achieve academic success, retention, and graduation.

When academic indicators suggest a student may be experiencing difficulties that may

negatively impact academic success, the instructor may raise a referral flag that notifies the student of concern through an email to the student's Richland email, requests a Student Success Coach or Student Success staff member contact the student to discuss and follow-up on the issue, or encourages student to discuss the matter with the instructor.

If you receive an email notification of a referral flag in any of your courses, you are encouraged to contact the instructor as soon as possible to discuss the issue. The purpose of the discussion is to accurately assess its potential impact on your academic success and to plan and put into action steps to be successful in the course. For more information about the Richland Thrive system, contact the Student Success Center at ext. 6267.

College & Division Policies

Academic Integrity Policy

All students are expected to maintain academic integrity in their academic work and honesty in all dealings with the College. A student who cheats, plagiarizes, or furnishes false, misleading information to the College is subject to disciplinary action up to and including failure of a class or suspension/expulsion from the College.

The Academic Integrity Policy also governs student misuse of intellectual property.

All work must be original and completed during the Fall 2022 semester to receive credit.

Students who are suspected of violating the Academic Integrity Policy may be required to take quizzes or exams in a proctored setting.

NetID Password and User Account Privacy

Your Richland NetID password should not be shared with anyone. Providing your password or account access to anyone else will be considered a violation of the RCC Academic Integrity Policy and the Responsible Use of Information Technology Policy.

To protect your account, you should always log off of College computers and online systems before exiting a classroom or public location.

Students who are suspected of allowing others to access their account may be required to take quizzes or exams in a proctored setting.

Non-Discrimination Policy

Richland Community College policy prohibits discrimination on the basis of race, color, religion, sex, marital or parental status, national origin or ancestry, age, mental or physical disability (except where it is a bonafide occupational qualification), sexual orientation, military status, status as a disabled or Vietnam-era veteran.

Responsible Use of Classroom Content

Class discussions, papers, pictures, video, and any other work created for a course are all considered official course content. Work including papers, discussions, quizzes, assignments, etc., must be confined to the classroom (either on-campus or virtual) and should not be shared outside the classroom without the express permission of the person who created it. Students should respect the privacy of person-to-person or person-to-class communication in all forms. Violating others' privacy may result in removal from the course. Significant or repeated violations may result in suspension or expulsion. This standard is pursuant to Board Policy 5.8.1 (Responsible Use of Information Technology) and the Code of Student Conduct

Copyright Notice

The materials used in this course are protected by Copyright law. Faculty lectures, course supplementary materials, articles, quizzes and exams, papers, data, web pages, and artwork are among the properties protected. This is not an exhaustive list. Items may or may not be marked with a Copyright symbol ©. Regardless, the intellectual property used in this course is owned by the creator who is the sole determiner of how the property is used, including but not limited to copying, distribution, performance, display, or revisions.

Any questions a student may have about the use of course materials can be explained by the instructor or library staff.

Student misuse of intellectual property is subject to the Academic Integrity Policy as explained in the Student Handbook and Section 5.9 of the Board Policy Manual.

Title IX and Sexual Misconduct

Richland Community College is committed to providing for all students a safe learning environment that is free of all forms of discrimination and sexual harassment, including sexual assault, domestic violence, dating violence, and stalking. If you (or someone you know) has experienced or experiences any of these incidents, know that you are not alone.

All Richland Community College faculty members are "responsible employees," which means that if you tell me about a situation involving sexual harassment, sexual assault, dating violence, domestic violence, or stalking, I must share that information with the Title IX Coordinator. Although I have to make that notification, you will control how your case will be handled, including whether or not you wish to pursue a formal complaint. Richland's goal is to make sure students are aware of the range of available options and have access to the needed resources.

If you wish to speak to someone privately, you can contact Growing Strong Sexual Assault Center at 217-428-0770.

More information about Title IX can be found on Richland's website at https://www.richland.edu/campus-police. Richland's Title IX Coordinator is Jody Burtnett, titleix@richland.edu, N117, phone: 217-875-7211, ext. 6288.

Electronic Communication Devices Policy

The Mathematics, Science, and Business Division prohibits the use of cell phones, pagers, and other non-learning electronic communication equipment within the classroom. All equipment must be turned off to avoid disturbances to the learning environment. If a student uses these devices during an examination, quiz, or any graded activity, the instructor reserves the right to issue no credit for these assignments. The instructor needs to approve any exceptions to this policy.

Richland Community College Core Values

- Commitment - We are dedicated to meeting the needs of the communities we serve.
- Respect - We recognize the expertise of all members of the College community and encourage individual contributions.
- Excellence - We strive to develop and pursue higher standards.
- Accountability - We assume and demonstrate responsibility for our actions.
- Diversity - We believe that our similarities and differences are opportunities for establishing a common bond and strengthening the College.

Other College Services

Richland provides many services to its students. While they may not directly pertain to this class, you may benefit from them. A list of support services with descriptions, phone numbers, and email addresses is found online at https://jics.richland.edu/syllabi/mastersyllabus-studentservices.pdf

Weekly Calendar

This course does not run on a calendar week basis. This chart is provided as a convenience for students who organize their life by calendar week.

Students will receive a separate daily calendar that contains the section numbers covered each day as well as the due dates for major activities. Due dates are also listed in Canvas.

Week 1, August 15–21 . . . . . Vectors

- Introduction to Cartesian Coordinates in Space: distance in space, planes, cylinders; surfaces of revolution; quadric surfaces
- An Introduction to Vectors: notation, magnitude/norm

Week 2, August 22–28 . . . . . Vectors

- An Introduction to Vectors: vector algebra, unit vectors, parallel vectors; standard unit vectors
- The Dot Product: dot product, properties of dot product; dot product and angles, orthogonal vectors; projections, work
- The Cross Product: cross product and properties, computing cross product; cross product and angles; applications

Week 3, August 29–September 4 . . . . . Vectors

- Lines: vector form, parametric form, symmetric form; parallel, intersecting, skew; distances
- Planes: standard form, general form; intersections; distances
- *Exam 10: Vectors*

Week 4, September 5–11 . . . . . Vector Valued Functions

- Vector-Valued Functions: algebra of vector-valued functions; displacement; average rate of change
- Calculus and Vector-Valued Functions: limits, continuity

Week 5, September 12–18 . . . . . Vector Valued Functions

- Calculus and Vector-Valued Functions: derivatives, tangents, product and chain rules; integrals, arclength
- The Calculus of Motion: velocity, speed, acceleration; projectile motion, distance traveled, average speed
- Unit Tangent and Normal Vectors: unit tangent vector, unit normal vector, unit binormal vector; tangential and normal components of acceleration

Week 6, September 19–25 . . . . . Vector Valued Functions

- The Arc Length Parameter and Curvature: arclength parameter, curvature
- *Exam 11: Vector Valued Functions*
- Introduction to Multivariable Functions: graphs; level curves; level surfaces

Week 7, September 26–October 2 . . . . . Multivariable Functions

- Limits and Continuity of Multivariable Functions: open, closed, bounded, unbounded sets; evaluating limits, properties of limits, limits that DNE; continuity
- Partial Derivatives: first and second partial derivatives; equality of mixed partials; understanding partial derivatives
- Differentiability and the Total Differential: total differentials; multivariable differentiability and continuity; approximation and error/sensitivity analysis

Week 8, October 3–9 . . . . . Multivariable Functions

- The Multivariable Chain Rule: chain rule for ordinary derivatives; chain rule for partial derivatives; implicit differentiation
- Directional Derivatives: directional derivatives; gradient
- Tangent Lines, Normal Lines, and Tangent Planes: directional tangent lines, normal lines to surface, distance from point to surface; uses of gradient

Week 9, October 10–16 . . . . . Multivariable Functions

- Extreme Values: relative and absolute extrema; critical points, saddle points; second derivative test, constrained optimization, extreme value theorem
- Lagrange Multipliers: contour plots; method of Lagrange multipliers; multiple constraints
- Lagrange Multipliers
- *Exam 12: Multivariable Functions*

Week 10, October 17–23 . . . . . Multiple Integration

- Iterated Integrals and Area: iterated integrals; area of a plane region; changing order of integration
- Double Integration and Volume: double integral, signed integral; Fubini's theorem; determining bounds
- Double Integration with Polar Coordinates: determining boundaries; Jacobian; applications

Week 11, October 24–30 . . . . . Multiple Integration

- Center of Mass: moments, mass of lamina; center of mass; discrete systems
- Surface Area: surface area
- Volume Between Surfaces and Triple Integration: volume, iterated integrals; projecting surface onto plane to find region; moments, mass, center of mass

Week 12, October 31–November 6 . . . . . Multiple Integration

- Triple Integration with Cylindrical and Spherical Coordinates: cylindrical coordinates; spherical coordinates; Jacobian
- Change of Variables: changing coordinate systems; Jacobian
- Change of Variables

Week 13, November 7–13 . . . . . Multiple Integration

- *Exam 13: Multiple Integration*
- Introduction to Line Integrals: introduction, line integrals over scalar fields, properties of line integrals; evaluating line integrals; mass and center of mass

Week 14, November 14–20 . . . . . Vector Analysis

- Vector Fields: vector fields, del operator, divergence, curl; potential functions
- Line Integrals over Vector Fields: line integral over vector fields, properties; fundamental theorem of line integrals, independence of path, conservative vector fields; curl of conservative fields

Week 15, November 21–27 . . . . . Vector Analysis

- Flow, Flux, Green's Theorem and the Divergence Theorem: flow, circulation, flex, Green's theorem; Divergence theorem in a plane

Week 16, November 28–December 4 . . . . . Vector Analysis

- Parametrized Surfaces and Surface Area: parametrized surfaces, smooth, orientable; surface area
- Surface Integrals: surface integrals; flux
- The Divergence Theorem and Stokes' Theorem: divergence theorem in space; Stoke's theorem

Finals Week, December 5–9. . . . . Finals

- *Comprehensive Final Exam, Monday, December 5, from 10:00 – 11:50 am.*