

Math 2131 Vector Calculus

LAKEHEAD UNIVERSITY – ORILLIA CAMPUS
WINTER 2026 COURSE SYLLABUS

Course Instructor

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Course Information

Class & Lab Meetings

- Lectures: Mondays & Wednesdays: 5:30pm – 7:00pm in OA 1033

Class Format

Class meetings will be very interactive! Each class will have lecturing components, in which we cover new material, together with problem-solving sessions, where you will get a chance to work through examples to solidify your understanding.

Course Description

Math 2131 is a course on multivariable and vector calculus. As per the calendar description, we will be studying: Coordinate systems and vectors; parametric curves and surfaces; partial differentiation; multiple integration; vector fields; and vector calculus including Green's theorem, Stokes' theorem, and the divergence theorem.

Prerequisites & Restrictions

Prerequisites: Math 1172 or permission of the Chair of the department

Textbooks

Optional Textbook:

- (*Free!*) Schlicker, Keller & Long: [Active Calculus](#)

Topics We Plan to Cover & Learning Objectives

- 3D Space, Vectors, Multivariable and Vector-Valued Functions
 - Understand the basics of the three-dimensional coordinate system and how to interpret a given set of points (both graphically and verbally)
 - Become familiar with vectors and their algebraic and geometric properties
 - Understand the geometric and algebraic definitions of the dot and cross products
 - Learn how to write out the equations of lines and planes and to read off the important information that such equations encode
 - Be able to differentiate and integrate vector-valued functions
 - Develop an understanding of function of two and three variables
 - Use contour diagrams and traces to describe the behaviour of a function
- Multivariable Calculus
 - Be able to compute the equations of tangent planes and use these to make linear approximations
 - Understand the geometric interpretation of a partial derivative and be able to compute partial derivatives algebraically
 - Be able to apply the multivariable chain rule in a variety of contexts
 - Know the geometric interpretation of directional derivatives and the gradient vector and how to compute the direction of maximal instantaneous rate of change of a function
 - Use the second-derivatives test to classify critical points of two-variable functions
 - Apply the method of Lagrange Multipliers to optimize functions of two variables subject to a given constraint
 - Use iterated integrals to express and evaluate a double integral over a general region
 - Express double integrals over circular regions using polar coordinates
 - Be able to set up and evaluate triple integrals in Cartesian, cylindrical, and spherical coordinates
- Vector Calculus
 - Match vector field formulas with their corresponding plots
 - Compute line integrals over vector fields via parametrization
 - Understand the relationship between conservative vector fields and path independence of line integrals
 - Apply Green's Theorem to swap a line integral for a double integral and vice versa
 - Compute the curl and divergence of a vector field and interpret these geometrically
 - Parametrize various surfaces and compute flux integrals
 - Interpret the meaning of Stokes's Theorem and the Divergence Theorem
 - Apply Stokes's Theorem and the Divergence Theorem to evaluate integrals

Depending on the time available, some of the topics may be adjusted.

Assessment

Assignments

There will be weekly homework assignments on WebWork due on Thursdays. These assignments assess your ability to use the material that we learned in class to solve problems. You are encouraged to work on the problems together with your peers, so long as you submit your solutions independently. There will be no extensions granted on the assignments. However, given that people get sick and face other extenuating circumstances and might not be able to meet the deadline every week, I will drop the two lowest homework scores for everyone. You do not need to e-mail me to request that the score be dropped—it will be automatic.

Post-class Quizzes

After most classes, you will be sent home with a short quiz (usually just a question or two). The purpose of the quiz is to make sure that you are keeping up with what we are doing in class. It also serves as a way for me to provide you with regular feedback on your work. The quizzes are due at the start of the next class. The lowest two quiz scores will be dropped.

Participation

The class meetings will be interactive. Attending classes, participating, and asking questions will all contribute to this component of the grade.

Tests and Exams

There will be two midterm tests during class and one final exam. The tentative dates for the midterms are:

- Midterm 1: Wednesday, February 4, 2025
- Midterm 2: Wednesday, March 18, 2025

It is your responsibility to ensure that you are in class during the dates of the test. **If you miss a test for whatever reason, please e-mail me ASAP.** If you miss the test for a valid reason, the weight of the midterm will be transferred to the final exam. You will be required to provide adequate documentation detailing the reason for your absence and inability to take the test (doctor's note, etc.). Without adequate documentation, you will likely receive a grade of 0 for that test.

Grading Scheme

Your final numerical grade will be determined by the following categories:

- | | |
|--------------------------|----------------------|
| • 11% WebWorks | • 16.25% Midterm 1 |
| • 11% Post-Class Quizzes | • 16.25% Midterm 2 |
| • 5% Participation | • 32.5% Final Exam |
| | • 8% Best Test Score |

Resources

Office Hours

Please come to my office hours! Do you want to say hello? Do you have a question about the course—even the tiniest thing? If there is anything that you are struggling with in our class or on the homework, that's what I'm here for. I'd love for you to come by. There is no such thing as a bad question. I will try to do my best to help you! You are also encouraged to work on the assignments during office hours, and just ask questions as they arise! Tentatively, office hours are scheduled for:

- Mondays from 2:30pm to 4:30pm (in OR 1035)
- Wednesdays from 2:30pm to 4:30pm (in OR 1035)

If you cannot make any of the above times for whatever reason, send me an e-mail and we can try to find another time to talk.

How to Succeed in Math 2131

Come to Class Ready to Work

Mathematics is best learned by actively working through problem—something we will spend a lot of classtime doing. Coming to class ready to engage with the material will ensure that you get the most out of it.

Don't be Afraid to Make Mistakes

Making mistakes is the most important part of doing mathematics! It is an integral part of the learning process. Never hesitate to share your reasoning (even if you think it's incorrect)—we cannot arrive at a correct answer if we don't understand why the incorrect ones don't work.

Work Together and Come To Office Hours

Working with your peers in class and on homework assignments can be very helpful. Two brains are better than one and having multiple perspectives when tackling a problem provides additional insight for it. Also, come to office hours—if I understand what you are having difficulties with, I can try to help make the course better.