



MATH 200:10M, Multivariate Calculus
Winter Term 1 – 2025

Instructor:

Dr. Johana Thomas Zapata (she/her) (You can call me “Johana” or “Dr. Zapata”)

Email: jthomaszapata@math.ubc.ca

Class Times: Monday, Wednesday and Friday, 1:00 – 1:50.

Class Location: HEBB Room 114

Office Hours: Location: S. Klinck Building (LSK), room 300.

Day/time: Wednesdays, 3:00 – 5:00 pm

Land Acknowledgment

We acknowledge that this course is held on the traditional, ancestral, and unceded territory of the **xʷməθkʷəy̓əm (Musqueam) people**. As a learning community, we are grateful for the opportunity to study and teach on this land, and we recognize our responsibility to learn from and alongside Indigenous peoples as part of our shared commitment to reconciliation and ethical engagement.

Course Overview and Expectations

The course will cover more or less the material described below in the (rough) schedule. Calculus is in essence the study of how to reduce more complicated (nonlinear) equations and phenomena to linear ones so that techniques in linear algebra can be applied. Usually one starts by studying simpler functions in one variable, such as $f(x) = \sin(x)$ and develops the theory of derivatives and integrals. This course extends this study to multivariable functions such as $f(x, y) = \sin(x^2 + y^2)$. The goal of the course is to teach students to:

- (1) manipulate vectors to perform geometric calculations,
- (2) calculate and interpret derivatives and integrals of functions in several variables,
- (3) apply these techniques to a range of applications.

As a learning community, we expect that you stay engaged, complete assignments diligently, and communicate any difficulties early. You’re not on this journey alone: regular attendance, active class participation, collaborative group work, and using available resources (including office hours, discussion sections, and online help) are crucial to both your success and that of your peers.

Primary Text: *CLP-3 Multivariable Calculus* by Joel Feldman, Andrew Rechnitzer, and Elyse Yeager. Available for free at: <https://personal.math.ubc.ca/~CLP/CLP3/>

Course Content and Schedule

The course is organized into three parts, corresponding to Chapters 1–3 in the textbook. We will allocate approximately 3 weeks to Chapter 1, 5 weeks to Chapter 2, and 5 weeks to Chapter 3.

Part I – 3-Dimensional Geometry (Chapter 1, except §1.6)

- Three-dimensional coordinate systems
- Vectors: arithmetic, dot and cross products
- Equations of lines and planes
- Equations of surfaces

Part II – Differentiation of Multivariable Functions (Chapter 2)

- Functions of several variables
- Limits and continuity
- Partial derivatives
- Tangent planes and linear approximations
- Chain rule
- Directional derivatives and gradient
- Maximum and minimum values, Lagrange multipliers

Part III – Integration of Multivariable Functions (Chapter 3, except §3.4, §3.8)

- Double and iterated integrals
- Double integrals in polar coordinates
- Triple integrals in Cartesian coordinates
- Triple integrals in cylindrical and spherical coordinates
- Applications

Grading Breakdown

- *Two Midterm Exams* ($2 \times 20\% = 40\%$): These in-class tests will assess your grasp of the material up to the exam date. You'll see problems that closely mirror your WebWork homework assignments, and each midterm will also include at least one problem taken directly—or adapted—from the CLP (Craig, Lea, and Pritchard) textbook. Completing WebWork and tackling CLP problems is essential preparation: these are the exact types of questions you'll face.
- *Final Exam* (40 %): A comprehensive assessment covering the full course. It will blend computational drills, conceptual proofs, and problem-solving involving multivariable functions—much like the midterms, drawing on homework-style problems (including WebWork), as well as occasional CLP-based questions.
- *WebWork Homework* (10 %): Regular online problem sets will provide structured, timely practice. Since exam questions are drawn directly from WebWork, staying on top of these assignments is one of the best ways to prepare. Timely completion and accuracy matter; late submissions may incur penalties.

- *Classwork, Participation, and Group Activities (10 %)*: This portion of your grade reflects your presence in class, willingness to participate, and engagement in group work or discussion sessions. In-class quizzes, small group problem-solving, and attendance all contribute points here. These cultivate essential communication and teamwork skills.

Alternate Marking Scheme: To support different learning trajectories, we will calculate your total term mark in two ways:

- *Total 1*: Homework (10%) + Midterm 1 (20%) + Midterm 2 (20%) + Final Exam (40%) + Extra (10%)
- *Total 2*: Homework (10%) + Best Midterm (35%) + Final Exam (60%) + Extra (5%)

You will receive the higher of the two totals. You may miss (or do poorly on) one homework assignment and one midterm without penalty—no explanation required. These concessions are intended to cover illness, emergencies, or other unforeseen circumstances, so please use them sparingly. **Further information** will be available on Canvas. ...

Expectations for Success

Learning calculus is more than memorizing formulas, it's about thinking critically, asking questions, and building a mathematical mindset. Here's what will help you thrive:

- *Be Present and Engaged.* Attend lectures regularly, contribute questions, and participate in group work.
- *Practice Deliberately.* Do your WebWoRK assignments carefully. These are not busywork; they mirror exam problems, so missing even a few can hurt your performance.
- *Tackle CLP Problems.* These are recommended but not required—except that each midterm will include at least one CLP-based problem. Doing CLP problems gives you a taste of exam-style rigour and helps build problem-solving stamina.
- *Use Resources.* If you're struggling, visit office hours, attend discussion sections, join study groups, or consult supplemental materials.
- *Reflect and Collaborate.* Talking through problems with classmates and reflecting on your solutions deepens understanding far more than working alone.

Official statement about the University's values and policies

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious, spiritual and cultural observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.

Details of the policies and how to access support are available here:

<https://senate.ubc.ca/policies-resources-support-student-success>