Syllabus for MATH 2370 (Multivariable Calculus), Summer 2025

Instructor: Michael Raney
Office: 310 St. Mary's
Office hours: TBD
Textbook: Multivariable Calculus, Ron Larson & Bruce Edwards, 12th edition (Cengage). The aim is to cover Chapters 11 through 15 of this textbook.

Course overview: MATH 2370 is a first course in the differential calculus and the integral calculus of functions of several variables. We start with coverage of vectors, then transition to functions of several variables and show how vectors may be used to analyze these functions, while additionally exploring visualizations of these functions. After considering vector-valued functions, we study optimization of functions of several variables, including the Lagrange multiplier method for constrained optimization. We next proceed to examine double integrals and triple integrals and their applications. The course concludes with line integrals and surface integrals, which motivate the fundamental theorems of vector calculus: Green's Theorem, Gauss's Theorem, and Stokes's Theorem.

Tentative course schedule (sections covered)

- Monday, July 7: 11.1 (vectors in the plane), 11.2 (space coordinates and the geometry of space), 11.3 (dot product)
- Tuesday, July 8: 11.4 (cross product), 11.5 (equations of lines and planes), 11.6 (surfaces)
- Wednesday, July 9: 11.7 (cylindrical and spherical coordinates), 12.1 (vector-valued functions), 12.2 (differentiation and integration of vector-valued functions)
- Thursday, July 10: 12.3 (velocity and acceleration), 12.4 (tangent vectors and normal vectors), 12.5 (arc length and curvature)
- Monday, July 15: 13.1 (functions of several variables), 13.2 (limits and continuity), 13.3 (partial derivatives)
- Tuesday, July 16: 13.4, (differentials), 13.5 (chain rule), 13.6 (directional derivatives and gradients)
- Wednesday, July 17: 13.7 (tangent planes and normal lines), 13.8 (extrema of functions of two variables)
- Thursday, July 18: 13.9 (applications of extrema), 13.10 (Lagrange multipliers)
- Monday, July 21: Review for Exam 1
- Tuesday, July 22: Exam 1
- Wednesday, July 23: 14.1 (iterated integrals and area), 14.2 (double integrals and volume), 14.3 (integrating using polar coordinates)
- Thursday, July 24: 14.4 (center of mass & moments of inertia), 14.5 (surface area)
- Monday, July 28: 14.6 (triple integrals), 14.7 (triple integrals in cylindrical and spherical coordinates)
- Tuesday, July 29: 14.8 (transforming variables using the Jacobian), 15.1 (vector fields)
- Wednesday, July 30: 15.2 (line integrals), 15.3 (conservative vector fields, independence of path)
- Thursday, July 31: 15.4 (Green's Theorem, 15.5 (parametric surfaces)
- Monday, August 4: 15.6 (surface integrals), 15.7 (Divergence Theorem)
- Tuesday, August 5: 15.8 (Stokes's Theorem)
- Wednesday, August 6: Review for Exam 2
- Thursday, August 7: Exam 2

Course structure:

- Online homework: 15%
- Handwritten homework: 15%
- Exam 1: 35%
- Exam 2: 35%

Exam 1 will cover Chapters 11, 12 and 13 of our textbook, and Exam 2 will cover Chapters 14 and 15. Each exam will be a 2.5 hour exam. For each you are allowed to bring a one-sided $8.5'' \times 11''$ sheet of notes.