Syllabus for MATH 2370-130 (Multivariable Calculus), Summer 2025

Instructor: Michael Raney
Office hours: Over Zoom, 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)

- *Week 1 (6/2 - 6/5)*: 11.1 (vectors in the plane), 11.2 (space coordinates and the geometry of space), 11.3 (dot product), 11.4 (cross product), 11.5 (equations of lines and planes)
- *Week 2 (6/9 - 6/12)*: 11.6 (surfaces), 11.7 (cylindrical and spherical coordinates), 12.1 (vector-valued functions), 12.2 (differentiation and integration of vector-valued functions), 12.3 (velocity and acceleration)
- *Week 3 (6/16 - 6/18)*: 12.4 (tangent vectors and normal vectors), 12.5 (arc length and curvature), 13.1 (functions of several variables), 13.2 (limits and continuity)
- *Week 4 (6/23 - 6/26)*: 13.3 (partial derivatives), 13.4 (differentials), 13.5 (chain rule), 13.6 (directional derivatives and gradients), 13.7 (tangent planes and normal lines)
- *Week 5 (6/30 - 7/3)*: 13.8 (extrema of functions of two variables), 13.9 (applications of extrema), 13.10 (Lagrange multipliers), 14.1 (iterated integrals and area), 14.2 (double integrals and volume)
- *Week 6 (7/7 - 7/10)*: 14.3 (integrating using polar coordinates), 14.4 (center of mass & moments of inertia), 14.5 (surface area), 14.6 (triple integrals), 14.7 (triple integrals in cylindrical and spherical coordinates). 14.8 (transforming variables using the Jacobian)
- *Week 7 (7/14 - 7/18)*: 15.1 (vector fields), 15.2 (line integrals), 15.3 (conservative vector fields), 15.4 (Green's Theorem)
- *Week 8 (7/21 - 7/24)*: 15.5 (parametric equations), 15.6 (surface integrals), 15.7 (Divergence Theorem), 15.8 (Stokes's Theorem)

Course structure:

- Participation in synchronous course meetings and group work: 10%
- Online homework (WebAssign): 20%
- Weekly quizzes: 6% each (so 42% in total)
- Final Exam (cumulative): 28%

Synchronous course meetings: We will meet synchronously during a typical week on Mondays through Thursdays from 1:00 - 1:45 pm EDT. Most of these sessions will be devoted to working on problems in groups. You are allowed to miss up to four synchronous sessions without penalty. But each missed day beyond these four will incur a reduction of 1% from the overall maximum participation percentage of 10%.

Online homework: Periodic homework problems will be assigned using WebAssign.

Weekly quizzes: A quiz will be given during each of the first seven weeks of the course. Your scanned handwritten quiz solutions are to be submitted to Canvas by the following Sunday at 11:59 pm.