

Fall 2019

Syllabus for Math 243 – Calculus III (3)

Course Description: Vector algebra, vector-valued functions, differentiation in several variables, and optimization.

Prerequisite: A grade of C or better in Math 242 or Math 252A or consent.

Text: Current Edition of: *Calculus*, eighth edition by James Stewart, Cengage Learning.

Format: This three credit class meets for 150 minutes of lecture per week.

Final Exam: The final exam will cover all the topics listed below.

Course objectives: Upon successful completion of Math 243 the student will have an understanding of topics listed below, be able to solve routine problems, and be able to apply the ideas.

Program objectives: This is the third course of our calculus sequence for STEM (Science, Technology, Engineering, Mathematics) majors. As these courses are introductory, the approach is more computational than theoretical. Mathematics is the basic language for STEM fields. Understanding the language, the basic ideas and results, and the computational techniques of calculus is prerequisite to any advanced learning in a STEM field.

Approximate Timeline:

Week 1-3: Parametric equations and Polar coordinates.

- (1) Section 8.1: Arc length
- (2) Section 10.1: Curves defined by parametric equations.
- (3) Section 10.2: Calculus with plane curves.
- (4) Section 10.3 Polar coordinates.
- (5) Section 10.4: Areas and lengths in polar coordinates
- (6) Section 10.5: Conic sections.
- (7) Section 10.6: Conic sections in polar coordinates. (optional)

Weeks 4–6: Vectors and the geometry of space.

- (1) Section 12.1: Three-dimensional coordinate systems.
- (2) Section 12.2: Vectors.
- (3) Section 12.3: The dot product.
- (4) Section 12.4: The cross product.
- (5) Section 12.5: Equations of lines and planes.
- (6) Section 12.6: Cylinders and quadric surfaces.

Weeks 7 - 9: Vector functions.

- (1) Section 13.1: Vector functions and space curves
- (2) Section 13.2: Derivatives and integrals of vector functions.
- (3) Section 13.3: Arc length and curvature.
- (4) Section 13.4: Motion in space: velocity and acceleration.

Weeks 10 - 15: Partial derivatives.

- (1) Section 14.1: Functions of several variables.
- (2) Section 14.2: Limits and continuity
- (3) Section 14.3: Partial derivatives.
- (4) Section 14.4 Tangent planes and linear approximations
- (5) Section 14.5: The chain rule.
- (6) Section 14.6: Directional derivatives and the gradient vector.
- (7) Section 14.7: Maximum and minimum values.
- (8) Discovery project p.1010: Quadratic approximation and critical points (Taylor's formula for two variables).
- (9) Section 14.8: Lagrange multipliers.