MATH-203 Multivariate Calculus

Prof. Kevin TeBeest   Fall 2021

Course Learning Objectives:

1. Transform between rectangular and polar coordinates in the plane, and transform among rectangular, cylindrical, and spherical coordinates in 3-space.
2. Sketch 2–dimensional and 3–dimensional figures in each of these coordinate systems.
3. Transform between rectangular and parametric representations of functions, plot and differentiate parametrically represented functions.
4. Understand algebraic operations of vectors; be able to use the dot– and cross–products to solve problems of geometry and physics.
5. Evaluate and plot multivariate functions.
6. Differentiate multivariate functions.
7. Locate and evaluate unconstrained and constrained optima.
8. Set up and evaluate double and triple integrals in the coordinate systems.
9. Use double and triple integrals to find areas, volumes, moments and center of mass.

APPROXIMATE LECTURE SCHEDULE [1]

WEEK	SECTIONS
1	10.1 — Parametric Equations
	10.2 — Calculus with Parametric Curves
	10.3 — Polar Coordinates
2	10.4 — Areas in Polar Coordinates
	12.1 — 3-D Coordinate Systems
	12.2 — Vectors
3	12.3 — Dot Product
	12.4 — Cross Product
	12.5 — Lines and Planes in 3-D
4	**EXAM 1 (tentatively Monday)**
	12.6 — Cylinders
	12.6 — Quadric Surfaces
5	14.1 — Functions of Several Variables
	14.3 — Partial Derivatives
6	14.4 — Tangent Planes and Linear Approximations
	14.5 — The Chain Rule
	14.6 — Directional Derivatives and the Gradient Vector
7	**EXAM 2 (tentative Monday)**
	14.7 — Maxima and Minima
	14.8 — Lagrange Multipliers [2]
8	15.1 — Double Integrals over Rectangles
	15.2 — Iterated Integrals
	15.3 — Double Integrals over General Regions
9	15.4 — Double Integrals in Polar Coordinates
	15.5 — Applications: Moments and Center of Mass
10	**EXAM 3 (tentatively Monday)**
	15.6 — Triple Integrals in Rectangular Coordinates
	15.7 — Triple Integrals in Cylindrical coordinates
11	15.8 — Triple Integrals in Spherical Coordinates
	FINAL EXAM — scheduled by administration

[1] This schedule is approximate as some sections will take longer to cover than others.
[2] Instructor's choice if time permits.