

MAT 320 Topics Outline

I. Vectors and the Geometry of Space

Week 1	<ul style="list-style-type: none">▪ Three-Dimensional Rectangular Coordinate▪ Vector Basics in two and three dimensions▪ Geometric and Algebraic properties of vectors▪ Components and lengths of vectors▪ The Dot Product and its properties
Week 2	<ul style="list-style-type: none">▪ Orthogonal projection of a vector▪ The Cross Product and its properties▪ Lines and Planes in Space▪ Parametric and vector equation of a line in space
Week 3	<ul style="list-style-type: none">▪ Parallel, intersecting and skew lines in space▪ Vector, point-normal, and general form of a plane▪ Relationships between lines and planes in space▪ Cylinders and Quadric Surfaces

II. Vector-Valued Functions and Motion in Space

Week 4	<ul style="list-style-type: none">▪ Definition of Vector Functions and space curves in space▪ Calculus of vector valued functions (Limits, continuity, derivatives, integration)
Week 5	<ul style="list-style-type: none">▪ Velocity, acceleration, and speed of a particle moving in space▪ Initial value problems in space▪ Modeling Projectile Motion
Week 6	<ul style="list-style-type: none">▪ Arc Length and the Unit Tangent Vector T▪ Curvature and the Unit Normal Vector N▪ Torsion and the Unit Binormal Vector B

III. Partial Derivatives

Week 7	<ul style="list-style-type: none">▪ Functions of Several Variables▪ Limits and Continuity in Higher Dimensions
Week 8	<ul style="list-style-type: none">▪ Partial Derivatives▪ The Chain Rule▪ Directional Derivatives and Gradient Vectors
Week 9	<ul style="list-style-type: none">▪ Tangent Planes and Differentials▪ Extreme Values and Saddle Points

IV. Multiple Integrals

Week 10	<ul style="list-style-type: none">▪ Review of the “area problem”▪ Double integrals over rectangles▪ Properties of the double integral
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	<ul style="list-style-type: none"> ■ Iterated integrals and Fubini's Theorem (First Form) ■ Partial integration ■ Double integrals over general rectangular regions ■ Evaluation of double integrals using Type I and Type II regions ■ Computing areas using double integrals ■ Computing volumes using double integrals
Week 11	<ul style="list-style-type: none"> ■ Polar Coordinates ■ Graphing functions using polar coordinates ■ Double integrals in Polar Form ■ Triple Integrals in rectangular coordinates over rectangular regions ■ Fubini's Theorem for triple integrals ■ Triple integrals in rectangular coordinates over general regions
Week 12	<ul style="list-style-type: none"> ■ Cylindrical coordinates ■ Graphing functions using cylindrical coordinates ■ Triple integrals in cylindrical coordinates ■ Spherical Coordinates ■ Graphing functions using spherical coordinates ■ Triple integrals in spherical coordinates

Instructor Options

- The Area of a Parallelogram's Projection on a Plane
- Planetary Motion and Satellites
- Lagrange Multipliers
- Partial Derivatives with Constrained Variables
- Taylor's Formula for Two Variables
- Moments and Centers of Mass in Two Dimensions
- Masses and Moments in Three Dimensions