Calculus - multivariable

- Calculus of vector valued functions
  - Arc length and curvature
  - Derivatives
  - Frames, motions, and other applications
  - Integrals
  - Limits and continuity
  - Parameterized curves
• Concepts for multivariable functions

- Notation, domain, and range
- Parameterized surfaces
- Quadratic surfaces
- Surfaces
- Surfaces in other coordinate systems
- Traces, contours, and level sets

• Differentiation of multivariable functions

- Chain rule
- Differentiability, linearization and tangent planes
- Directional derivatives and the gradient
- Extreme values and optimization
- Lagrange multipliers and constrained optimization
- Limits and continuity
- Partial derivatives
• **Fundamental theorems**

  - Divergence theorem
  - Green's theorem
  - Line integrals
  - Stokes' theorem

• **Integration of multivariable functions**

  - Applications of double integrals
  - Applications of triple integrals
  - Change of variable
  - Double integrals in polar
  - Double integrals over general regions
  - Double integrals over rectangles
  - Iterated integrals and Fubini's theorem
  - Triple integrals
  - Triple integrals in cylindrical and spherical
• Vector calculus

- Applications of line integrals
- Conservative vector fields
- Curl and divergence
- Line integrals
- Surface integrals of scalar fields
- Surface integrals of vector fields

• Vector fields

- Graphs, flows lines, and level surfaces
- Identifying extrema from graphs

• Vector geometry

- Coordinate systems
- Cross product
- Dot product, length, and unit vectors
- Vectors and vector arithmetic