I. Background material:  
- Dot and cross products and their properties
  - Equations of lines, planes and quadric surfaces (ellipsoids, paraboloids, hyperboloids, cylinders, cones)
  - Slicing and projecting quadric surfaces
  - Examples!

II. Vector functions:  
- Definition, vector functions as space curves
  - Differentiation and integration
  - Arc length and curvature (various formulas)
  - Velocity, acceleration, and Newton’s second law
  - Examples!

III. Differential multivariable calculus:  
- Functions of several variables, finding domains
  - Definition and calculation of limits (different limits along different paths/squeeze theorem, limit rules)
  - Definition of and proving continuity (elementary functions are continuous)
  - Definition and geometric interpretation of partial derivatives
  - Differentiability vs. partial derivatives
  - Meaning and computation of linearization
  - Equation of the tangent plane to a surface given as the graph of function or a level surface
  - The Chain Rule
  - Definition, meaning and calculation of directional derivatives
  - The gradient: definition, meaning and applications
  - Finding maxima and minima without constraints: first and second derivative tests
  - Finding maxima and minima with constraints: Lagrange multipliers (geometric interpretation!), finding absolute extrema
  - Examples!

IV. Integral multivariable calculus:  
- Double integrals over rectangles: definition, meaning, calculation (iterated integrals and Fubini’s theorem)
  - Double integrals over regions of type I and II, and their unions: Fubini’s theorem
  - Double integrals in general regions (don’t forget the r!)
  - Triple integrals over boxes and regions of type I, II, and III: calculation via Fubini’s theorem
  - Calculation of areas and volumes
  - Draw good pictures
  - Examples!