I. Background material (Chapter 12):  
- Dot and cross products and their properties  
- Equations of lines, planes and quadric surfaces (ellipsoids, paraboloids, hyperboloids, cylinders, cones)  
- Slicing and projecting quadric surfaces

II. Vector functions (Chapter 13):  
- Differentiation and integration  
- Arc length and curvature (various formulas)  
- Velocity, acceleration, and Newton’s second law

III. Differentiation (Chapter 14):  
- 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  
- Linearization and linear approximation  
- Tangent planes (to the graph of function and to a level surface)  
- The Chain Rule  
- Definition, meaning and calculation of directional derivatives  
- The gradient: definition, meaning and applications  
- Maxima and minima without constraints: first and second derivative tests  
- Maxima and minima with constraints: Lagrange multipliers (geometric interpretation!), finding absolute extrema

IV. Multiple Integrals (Chapter 15):  
- Double integrals over rectangles: iterated integrals and Fubini’s theorem  
- Double integrals over regions of type I and II (Fubini’s theorem again)  
- Polar coordinates (Jacobian = r)  
- Triple integrals over boxes and regions of type I, II, and III: Fubini’s theorem  
- Calculation of areas and volumes  
- Cylindrical coordinates (Jacobian = r)  
- Spherical coordinates (Jacobian = ϱ² sin φ)  
- Practice drawing good pictures

V. Vector calculus (Chapter 16):  
- Line integrals of the first and second kind  
- FTC for line integrals. Conservative vector fields  
- Green’s theorem and applications (computation of area)  
- Curl and div, and applications. Solving \( \nabla f = F \).