



Department of Mathematics  
Johns Hopkins University

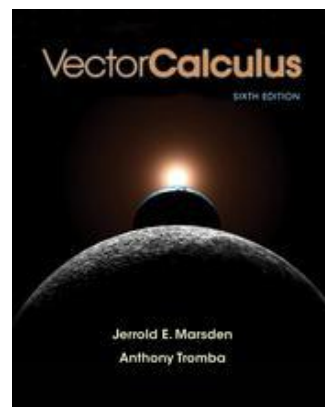
# AS.110.202 Calculus III Course Syllabus

The following list of topics is considered the core content for the course AS.110.202 Calculus III. The current text for the course is:

**Text:** [Vector Calculus](#), 6<sup>th</sup> Edition, Marsden, J., and Tromba, A., W.H. Freeman, August 2003, ISBN-13: 9781429215084, ISBN-10: 1429215089.

## Course Topics

- **The Geometry of Euclidean Space (1 week)**
  - 1.1 Vectors in Two- and Three-Dimensional Space
  - 1.2 The Inner Product, Length, and Distance
  - 1.3 Matrices, Determinants, and the Cross Product
  - 1.4 Cylindrical and Spherical Coordinates
  - 1.5  $n$ -Dimensional Euclidean Space
- **Differentiation Space (2 weeks)**
  - 2.1 The Geometry of Real-Valued Functions
  - 2.2 Limits and Continuity
  - 2.3 Differentiation
  - 2.4 Introduction to Paths
  - 2.5 Properties of the Derivative
  - 2.6 Gradients and Directional Derivatives
- **Higher-Order Derivatives: Maxima and Minima (2- weeks)**
  - 3.1 Iterated Partial Derivatives
  - 3.2 Taylor's Theorem
  - 3.3 Extrema of Real-Valued Functions
  - 3.4 Constrained Extrema and Lagrange Multipliers
  - 3.5 The Implicit Function Theorem
- **Vector-Valued Functions (1+ weeks)**
  - 4.1 Acceleration and Newton's Second Law
  - 4.2 Arc Length
  - 4.3 Vector Fields
  - 4.4 Divergence and Curl
- **Double and Triple Integrals (1 week)**
  - 5.1 Introduction
  - 5.2 The Double Integral Over a Rectangle
  - 5.3 The Double Integral Over More General Regions
  - 5.4 Changing the Order of Integration
  - 5.5 The Triple Integral
- **The Change of Variables Formula and Applications of Integration (1 week)**
  - 6.1 The Geometry of Maps from  $\mathbb{R}^2$  to  $\mathbb{R}^2$
  - 6.2 The Change of Variables Theorem





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- **Integrals (2 weeks)**
  - 7.1 The Path Integral
  - 7.2 Line Integrals
  - 7.3 Parameterized Surfaces
  - 7.4 Area of a Surface
  - 7.5 Integrals of Scalar Functions Over Surfaces
  - 7.6 Surface Integrals of Vector Functions
  
- **The Integral Theorems of Vector Analysis (2 weeks)**
  - 8.1 Green's Theorem
  - 8.2 Stokes' Theorem
  - 8.3 Conservative Fields
  - 8.4 Gauss' Theorem