

Topics for Exam 1**1. Euclidean Space**

- 1.1 Definition of n -Dimensional Euclidean Space
- 1.2 Spans, Lines and Planes
- 1.3 Dot Product and Euclidean Norm
- 1.4 Orthogonality and Projections
- 1.5 The Cross Product in \mathbf{R}^3

2. Continuous Functions

- 2.1 Vector fields, scalar fields and paths
- 2.2 Definition of continuous function
- 2.3 Compositions of Continuous Functions
- 2.4 Limits and continuity

3. Differentiability

- 3.1 Definition of differentiability
- 3.2 The derivative as a linear approximation
- 3.3 Derivatives of vector valued functions
- 3.4 Derivatives of scalar fields
 - i. The gradient
 - ii. Partial derivatives
 - iii. Directional derivatives
- 3.5 Derivatives of paths
 - i. Differentiable paths
 - ii. Tangent line to a path

Relevant sections in the text: 1.2, 2.1, 2.3, 2.5, 3.3, 4.1, 4.2, 4.3

Relevant sections in the online class notes: 2.1, 2.2, 2.3, 2.4, 2.5.1, 2.5.2, 3.1, 3.2, 3.3.1, 3.3.2, 3.3.3, 3.3.4, 4.1, 4.2, 4.3, 4.4, 4.5.1, 4.5.2 and 4.5.3.

Important Concepts: Euclidean space, dot product, orthogonal projections, cross product, continuous function, differentiability, the derivative map, partial derivatives, and the gradient.

Important Skills: Know how to compute projections; know how to find equations of lines and planes; know how to show that a function is continuous or not; know how to show whether a function is differentiable or not; know how to compute partial derivatives, gradients and directional derivative of scalar fields; know how to compute derivatives of differentiable paths.