

# Lecture X: Topic Name

Professor Name

Lecture Date

## 1 Introduction

Today we will study [topic]. The main goal is to understand [objective].

## 2 Main Concepts

**Definition 2.1.** A function  $f : X \rightarrow Y$  is called **continuous** if for every open set  $V \subseteq Y$ , the preimage  $f^{-1}(V)$  is open in  $X$ .

**Theorem 2.2.** *Every continuous function from a compact space to a Hausdorff space is closed.*

*Proof.* Let  $f : X \rightarrow Y$  be continuous where  $X$  is compact and  $Y$  is Hausdorff... □

**Example 2.3.** Consider the function  $f(x) = x^2$  on  $\mathbb{R}$ . This function is continuous because...

*Remark 2.4.* The converse of the theorem is not always true.

## 3 Important Results

**Lemma 3.1.** *If  $f$  is continuous and  $K$  is compact, then  $f(K)$  is compact.*

## 4 Exercises

1. Prove that composition of continuous functions is continuous.
2. Show that  $f(x) = \sin(x)$  is uniformly continuous on  $\mathbb{R}$ .