# Calculus A for Economics

## Syllabus and General Instructions

The final exam will be the same for all parallel sessions. The final is a closed exam. That is, you cannot use a calculator and cannot bring with you any notes of any kind.

The material for the course can be found in any calculus book. For example, you can look at

**1)** " Calculus: One and Several Variables", by Salas and Hille.

**2)** " Advanced Calculus". by M. Spiegel, Schaum's Series.

These books, and many more, can be found in the library of Exact Science.

If you intend to buy a book, we do recommend that you consult your instructor before doing that.

The syllabus given below, is the course syllabus. An instructor may choose to teach some of the material in a different order. If you find any mistakes, please tell your instructor. This way we can correct them for future generations.

Enjoy!!

# 1 Real Functions of One Variable

## 1.1 Week 1: Introduction and Basic Definitions

The Real numbers, Intervals, Absolute Value, The Triangular Inequality, Definition of a Function, Domain and Range of a Function, Piecewise-Defined Functions, Even and Odd Functions, One to One Functions.

## 1.2 Week 2: Operations between Functions

Elementary Operation between Functions, Composite Functions, Inverse of a Function, The Graphic Interpretation of the Inverse Function, Inverse of a One to One Functions, Exponential Functions, Logarithm Functions.

# 2 Limit of a Function, Continuous Functions

## 2.1 Week 3: Definition of a Limit

Intuitive Definition, Precise Definition of a Limit, Examples from the Definition, Uniqueness of the limit ( with proof), Limits of Sum and Product of Limits ( with proof), Limit of Quotient, One Side Limits.

## 2.2 Week 4: Limits at Infinity and Continuous Functions

The Sandwich Theorem ( with proof), The Relation between One Side Limits and a Limit, Limits at Infinity, Definition of a Continuous Function at a Point, Continuous at a Open or Closed intervals, Continuity of Sum, Product, Quotient and Composite of Functions ( with proofs).

## 2.3 Week 5: Properties of Continuous Functions

A Continuous Function in $[a, b]$ such that $f(a)f(b) < 0$ Vanish in $[a, b]$, A Continuous Function is Bounded in $[a, b]$, Examples.

# 3 The Derivative

## 3.1 Week 6: Definition and Basic Properties

Definition of the Derivative, Examples, One Side Derivative, A Differentiable Function is Continuous ( with proof), Derivative of Sum( with proof) , Product ( with proof), Quotient.

## 3.2 Week 7: Geometric Interpretations and the Chain Rule

The Derivative as a Slope, The Tangent and Normal Lines, The Derivative of Composite Functions: The Chain Rule ( proof - optional), Derivative of the Logarithm Function.

## 3.3 Week 8: Implicit Differentiation

Implicit Function, Differentiation of Implicit Functions, The identity $\frac{dy}{dx}\frac{dx}{dy} = 1$, The Derivative of the Exponential Function, L'Hospital Rule.

## 3.4 Week 9: Applications of Derivative

If $x_0$ is an Extreme Point then $f'(x_0) = 0$ ( with proof), Rolle's Theorem ( with proof), The Mean Value Theorem ( with proof), Examples, If $f'(x)$ is zero in an Interval then $f(x)$

is Constant on the Interval ( with proof), The Mean Value Theorem of Cauchy ( proof - optional), The Proof of L'Hospital Rule ( optional).

# 4 Extreme Points and Applications

## 4.1 Week 10: Extreme Points

Definitions, Local and Global Maximum and Minimum Points, Domains of Increasing and Decreasing, Inflection Points, Concavity.

## 4.2 Week 11: Applications

The Second Derivative Test for Extreme Points ( proof - optional), Minimum/Maximum Problems, Vertical and Horizontal Asymptotes.

## 4.3 Week 12: Drawing a Graph of Functions of One Variable