

THE UNIVERSITY OF THE WEST INDIES, MONA

ECON2016: CALCULUS

Semester II, 2020-21

Lecturer: Xhano Soares

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Lecture Times: Tue 8 – 9 am & Wed 1 – 2 pm

Office Hours: Mon 6 – 7 pm & Tue 10 – 11 am

Pre-requisites: ECON1004 **OR** MATH1150 **OR** MATH1180

Anti-requisites: MATH2125, MATH2160

Description

This course is a continuation of ECON1006 - Calculus I. Differential and Integral Calculus have widespread applications in several areas of the Social Sciences, therefore this course will prove invaluable to any serious social scientist. Several of the ideas explored in Calculus I will be revisited. However, this time the emphasis will be on rigour. You will be introduced to the proofs of some of the fundamental results of Calculus and will learn how to use these facts to prove other results. Although the emphasis here is on rigour, the computational aspects of the course will not be neglected and will be explored in several real life applications throughout the course.

Learning Outcomes

Upon successful completion of this course, the student should be able to:

- Discuss the concavity of functions of several variables
- Solve unconstrained optimization problems
- Use Lagrange multipliers to solve constrained optimization problems
- Use the Karush – Kuhn – Tucker conditions to find optimal solutions to nonlinear programming problems
- Solve a variety of linear and nonlinear first order differential equations
- Solve linear second order differential equations
- Apply differential equations to problems in economics
- Use substitution and eigenvector methods to solve systems of differential and difference equation

Modes of Delivery

Two lecture hours per week. Problem sets (not for grading) will be provided for practice at problem solving.

Assessment

- Quizzes 20% There will be two in – class quizzes @10% each
- Mid-semester examination 30%
- Final examination 50%

Syllabus

1. Optimization of Functions of n Variables

- 1.1 First order conditions
- 1.2 Second order conditions
- 1.3 Direct restrictions on variables
- 1.4 Constrained optimization

2. Non-Linear Programming

- 2.1 The non-linear programming problem
- 2.2 Convex sets
- 2.3 Convex and concave functions
- 2.4 Convex and concave programming
- 2.5 Quadratic programming
- 2.6 The Karush-Kuhn-Tucker conditions

3. Differential Equations

- 3.1 Non-linear first order differential equations
- 3.2 Stability analysis
- 3.3 Bernoulli's equations
- 3.4 Solution of linear second order differential equations (homogenous and Non-homogenous)
- 3.5 Steady state and convergence
- 3.6 Systems of linear differential equations (substitution method and eigenvector method)

4. Difference Equations

- 4.1 Non-linear first order difference equations
- 4.2 Stability analysis
- 4.3 Solution of linear second order difference equations (homogenous and nonhomogenous)
- 4.4 Steady state and convergence
- 4.5 Systems of linear second order difference equations (substitution method and eigenvector method)

Resources

Prescribed Text: Michael Hoy *et al*, *Mathematics for Economics, 3rd Edition*, MIT Press, Cambridge, 2011