

Study Guide for Mathematical Economics

1 Introduction

In this course we cover many topics in mathematics which are used in economic analysis. The formal prerequisite is a first year university course in calculus and linear algebra. The courses Math 135 and Math 136 offered at Macquarie University should offer adequate preparation, however hard work and some intellectual maturity can compensate for any missing background. Indeed hard work and some intellectual maturity are required even with adequate prior mathematics.

We will be using *Introduction to mathematical economics* by Edward T. Dowling, [Dow01]. This is a Schaum's outline and contains many worked examples. A calculus book such as Stewart's *Calculus*, [Ste99], and a linear algebra book such as Anton's *Elementary linear algebra*, [Ant00] may also be useful as a reference. Additional references will be provided during the semester.

2 Week by Week Outline

Week 1 We consider some economic applications of graphs, equations and derivatives. In particular the Cobb-Douglas production function, the isoquants that arise as the level sets, and isocost lines which are tangent to the isoquants.

We will also review some of theory and results regarding functions and derivatives.

Recommended reading: *Dowling* Chapters 1–3.

Week 2 derivatives, marginality, and relative extrema

Recommended reading: *Dowling* Chapters 3 and 4.

Week 3 multivariable calculus

Recommended reading: *Dowling* Chapter 5.

Week 4 multivariable calculus and applications of multivariable calculus Lagrange multipliers

Recommended reading: *Dowling* Chapters 5 and 6.

Week 5 applications of multivariable calculus and exponential and logarithmic functions

Recommended reading: *Dowling* Chapters 6–8.

Week 6 exponential and logarithmic functions and applications

Recommended reading: *Dowling* Chapters 8 and 9.

Week 7 linear algebra

Recommended reading: *Dowling* Chapters 10 and 11.

Week 8 applications of determinants and matrices

Recommended reading: *Dowling* Chapter 12.

Week 9 Statics and concave programming

Recommended reading: *Dowling* Chapter 13.

Week 10 Statics and concave programming

Recommended reading: *Dowling* Chapter 13.

Week 11 differential equations

Recommended reading: *Dowling* Chapter 16.

Week 12 difference equations

Recommended reading: *Dowling* Chapter 17.

Week 13 second order differential equations

Recommended reading: *Dowling* Chapter 18.

3 Assessment

There will be a midterm during the seventh week of class, a final exam at the end and six homework assignments.

Assessment will be computed from homework marks, midterm marks, and final examination marks. The final grade will be computed using the formula:

10% Homework 10% Midterm Exam 80% Final Exam.

References

- [Ant00] Howard Anton, *Elementary linear algebra*, 8 ed., John Wiley & Sons, New York, 2000.
- [Dow01] Edward T. Dowling, *Introduction to mathematical economics*, McGraw-Hill, 2001.
- [Ste99] James Stewart, *Calculus*, 4 ed., Brooks/Cole Publishing Company, 1999.