

REQUIRED CONTENT OF ECON 1088: MATH TOOLS FOR ECONOMISTS 2

Econ 1088: Math Tools for Economists 2 is a “core course” in the sense that, by teaching fundamental principles, it forms a pre-requisite for many courses. It is important that instructors teaching the courses for which this course is the pre-requisite know that students have learnt the fundamental principles, so that these more advanced courses can build on this knowledge without reteaching it. Therefore it is appropriate that this course has “required content”. “Required content” is a list of topics which it is necessary that the course cover. However, it is not an exhaustive list: the instructor is free to add additional topics provided he/she covers the required content.

“Required content” is required to be taught by all instructors of these courses, whether tenure-track, instructors or GPTIs

SECTION A: Differentiation

This material is vital for understanding the material covered later in the course, and is at the mathematical core of virtually every advanced class in economics. Derivatives allow us to mathematically express “thinking at the margin”, as well as a host of other dynamic concepts. Every concept in this section is used in Econ 3070.

1. Definition of a derivative: continuity and limits are essential to understanding the definition. Also includes tangents, slopes, derivative notation, and existence.
2. Simple derivative applications: Includes rates of change, increasing and decreasing functions.
3. Simple rules for differentiation: Includes the Power Rule, Sum and Difference Rules, constants, Product Rule, and Quotient rule.
4. The Chain Rule: economic applications should be included.
5. Higher-order derivatives: Includes convex and concave functions as well as n^{th} order derivatives.
6. Derivatives of exponential and logarithmic functions.
7. Elasticities

SECTION B: Single-variable Optimization

This topic should include an introduction to optimization, tests for local and global extrema, the 2nd derivative test, and inflection points. This section should illustrate these concepts with a plethora of economic applications (e.g. simple profit maximization).

SECTION C: Functions and derivatives of many variables

Most of the material covered in Econ 3070 requires a good understanding of multivariate functions and partial derivatives.

1. Functions of two variables and partial derivatives: Includes discussion on domains, ranges, independent and dependent variables, definitions for partial derivatives, higher-order partial derivatives, and geometric representation of partial derivatives. This section should also include the use of functions often used in economics (e.g. Cobb-Douglas).
2. Functions of more variables: covering partial derivatives of functions with more variables and economic applications (e.g. partial elasticities).

SECTION D: Introduction to Integration

This material is used in Econ 3818, and in certain 4000-level classes such as Econ 4535 and Econ 4545.

1. Indefinite integrals: Includes the definition of an integral, and some general rules and uses including finding areas (these are concepts important for Econ 3818).
2. Definite integrals and their economic applications (e.g. producer and consumer surplus).