

# Applied Mathematics (40 hours)

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There are efforts in diverse fields of law [...] to deal with facts on a more systematic and objective basis: It is natural that these efforts to make law more "scientific" should involve mathematics [...] The resolving power of a mathematical approach is very high, and it brings into focus our inchoate ideas and purposes, just as we gain perspectives of a different sort from a study of foreign codes or historical processes.

M. O. Finkelstein, 1978

## Pre-requisites:

Elementary algebra and set theory (polynomials, factoring, fractions, exponents and radicals, sets and set operations)  
Linear and quadratic equations  
Rectangular coordinate system

## Differential calculus

Functions of one variable  
Derivatives and Differentials  
Definition of integral  
Maxima and minima (unconstrained)  
Vectors and matrices: a review  
Functions of several variables  
Partial derivatives and differentials  
Maxima and minima (unconstrained, constrained)  
Applications to expected utility maximization

Textbook:

Budnick, F.S., 1983, Applied Mathematics, 2<sup>nd</sup> ed., McGraw-Hill or

Chiang, A., 1974, Fundamental Methods of Mathematical Economics, 2<sup>nd</sup> ed., McGraw-Hill

## Mathematics for finance

Compound and simple interest, constant and variable rates  
Amortizing loans  
Net present value and internal rate of return

Textbook:

Budnick, F.S., 1983, Applied Mathematics, 2<sup>nd</sup> ed., McGraw-Hill

## Applications to risk assessment, principal agent theory and judicial problems

Risk issues, measurement and management for legal contracts  
Risk management via insurance contracts  
Risk management via financial contracts  
Agency problems in contract fulfilling: action risk  
Agency problems in litigation

Material:

E. Luciano, 2004, Risk transfer and agency risk: some examples of mathematical modelling in law & economics, Mimeo.

Crocker K. J. and S. Tennyson , 2002, Insurance fraud and optimal claim settlement strategies, *The journal of Law & Economics*, vol XLV (2), pp.469-508

Cummins J.D. , Phillips R.D. and M.A. Weiss, 2001, The incentive of no-fault automobile insurance, *The Journal of Law & Economics*, vol XLIV (2), pp.427-464

Santore R. and A.D. Viard, 2001, Legal fee restrictions, moral hazard, and attorney rents, *The Journal of Law & Economics*, vol XLIV (2), pp.549-572