

## Data Science Summer School – Introduction to Calculus

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**Course Description:** The course will provide an overview of the mathematical prerequisites for the data science program.

**References:** There is no required textbook for the course; the material will be completely self-contained. Below is a short list of good, general references (of varying difficulty).

- C. P. Simon and L. Blume, *Mathematics for Economists*
- A. de la Fuente, *Mathematical Methods and Models for Economists*
- R. K. Sundaram, *A First Course in Optimization Theory*

### Outline of the Course:

- Analysis in  $\mathbb{R}$ : the real line, and sequences
- Calculus in  $\mathbb{R}$ : limits, continuity, differentiation (definition and basic rules, derivatives of elementary functions, monotonicity, higher-order derivatives), and integration (indefinite integrals as antiderivatives, integration by parts and by substitution, definite integrals)
- Unconstrained optimization in  $\mathbb{R}$ : existence of optima, first-order conditions, second-order conditions
- Calculus in  $\mathbb{R}^n$ : real-valued functions of several real variables, limits, continuity, differentiation (partial derivatives, directional derivatives, Hessian), and multiple integrals