

## The Department of Mathematics

2022–23–B term

**Course Name** Infinitesimal Calculus 2

**Course Number** 201.1.1021

**Course web page**

<https://www.math.bgu.ac.il/en/teaching/spring2023/courses/infi2>

**Lecturer** Prof. Eitan Sayag, <sayage@bgu.ac.il>, Office 107

**Office Hours** <https://www.math.bgu.ac.il/en/teaching/hours>

### Abstract

### Requirements and grading<sup>1</sup>

### Course topics

The derivative as a function: continuously differentiable functions, Darboux's theorem. Convex functions: definition, one-sided differentiability, connection to the second derivative. Cauchy's generalized Mean Value Theorem and its applications: L'Hospital's rule, Taylor polynomials with Lagrange remainder. The Newton-Raphson method. Series: Cauchy's criterion, absolutely convergent series, the comparison, quotient and root tests, the Dirichlet test, change of the order of summation, the product formula for series, Taylor series, Taylor series of elementary functions. The definition of an analytic function, the radius of convergence of a power series. The Riemann integral. Riemann sums. The fundamental theorem of calculus (the Newton-Leibniz formula). Methods for computing integrals (the indefinite integral): integration by parts, change of variable, partial fractions. Improper integrals. Numerical integration: the midpoint, trapezoid and Simpson's rules. Stirling's formula. Introduction to convergence of functions, problems with pointwise convergence. Introduction to ordinary differential equations: the differential equation  $y' = ky$ , solution of first order ODE's by separation of variables, initial value conditions.

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<sup>1</sup>Information may change during the first two weeks of the term. Please consult the webpage for updates