CentraleSupélec
Accelerated Engineering Degree Programme
Master's level

université PARIS-SACLAY

MATHEMATICS

Oral examination programme for bachelor's students with an academic background in mathematics (30 minutes) – June 2021

Linear algebra

- Linear mappings, matrices (kernel, range, rank-nullity theorem, matrix of a linear mapping)
- Determinant, linear systems
- Reduction of endomorphisms and square matrices (eigenvalues, eigenspaces, characteristic polynomials)

Inner-product spaces, Euclidean spaces

- Real inner product, associated norm
- Orthonormal basis
- Orthogonal projection

Topology of R, normed vector spaces

- Open intervals, closed intervals
- Norms, balls associated to a norm

Sequences and series

- Numerical sequences and series (monotonicity, convergence, equivalence, comparison theorems)
- Sequences and series of functions (monotonicity, convergence, equivalence, the particular case of power series)

Functions of one real variable

- Limits, continuity, differentiability (intermediate value theorem)
- Taylor formulas, Taylor expansions, equivalence in the neighborhood of a point

Integration on compact intervals, generalized integrals

- Integrals of piecewise continuous functions, convergence of Riemann sums
- Absolutely convergent integrals
- Comparison theorems

Differential calculus

- Computing a gradient, computing the derivative of composite functions

Linear differential equations, linear differential systems of first order

Probability

- Random variables
- Laws, moments, transfer theorem
- Random vectors, independence

Algebraic structures

- Groups, rings, fields, linear spaces
- Arithmetic in Z
- Polynomials