Department of Mathematical Informatics

Entrance Examination for Doctoral Program
(Summer)

Specialized Subject: Mathematical Informatics

August 21, 2025 (Thursday) 10:30 – 12:00

Please note:

(1) Answer in Japanese or English.

(2) Any answer sheet with marks or symbols unrelated to the answer will be invalid.

(3) Do not send or show this file to anybody else. Delete it after the examination.

Question

Select three keywords from the list below. For each selected keyword, describe its mathematical informatics aspects, including its definition, relevant theorems, examples, and applications. You may use at most three pages for each keyword. Explanations for different keywords must be written on separate pages.

(1) Cauchy's integral formula

(2) Chinese remainder theorem

(3) Diffie-Hellman key exchange

(4) interior point methods

(5) Lévy process

(6) linear programming duality

(7) Lyapunov exponent

(8) Markov chain Monte Carlo methods

(9) post-quantum cryptography

(10) reinforcement learning