

## Homework 0

**Due: Sept. 22 2025**

Note: The purpose of this assignment is to help you review some basic mathematical concepts in calculus and linear algebra.

1. What is the definition of a derivative for a univariate function  $f(x)$ .
2. What is the Taylor expansion for a function  $f(x)$  at a point  $x_0$ ?
3. What is the Newton-Leibniz formula? What is the integration-by-part?
4. What do we know about symmetric matrices? Further, what do we know about positive definite matrices?
5. What is the LU factorization of a non-singular square matrix?
6. How do we solve a linear system of equations  $\mathbf{Ax} = \mathbf{b}$  based on the LU factorization? Please briefly explain the procedures.