Numerical Analysis (CS 450)

Worksheet 20

Objectives: (1) Understand existence/uniqueness/sensitivity results for optimization problems **(2)** Be able to choose among 1D optimization methods **(3)** Understand limitations of steepest-descent methods

Problem 1: Quadratic approximation and Newton

(a) Write down the $O(h^3)$ Taylor series approximation for a function $f : \mathbb{R}^n \to \mathbb{R}$?

(b) Where does your Taylor approximation achieve its minimum?

(c) Consider $f(x) = 5x^2 + 3x + 1$. How many iterations does Newton's method use to converge to the minimum of f?

(d) What is the convergence rate for steepest descent in the observed demonstration?