

Math 164-1: Optimization – Homework 6

Due: May 6, 2016

Exercise 1.

Extend the golden section and Fibonacci algorithms to dimensions 2 and 3. As we discussed about it during the lecture, this could be reasonable only for rectangular domains. Hence let $a_i, b_i \in \mathbb{R}$, with $a_i < b_i$ for all $i \in \{1, 2, 3\}$ and let $\Omega_2 := [a_1, b_1] \times [a_2, b_2]$ and $\Omega_3 := [a_1, b_1] \times [a_2, b_2] \times [a_3, b_3]$. We consider the functions $f : \Omega_2 \rightarrow \mathbb{R}$ and $g : \Omega_3 \rightarrow \mathbb{R}$ and we assume that f and g are unimodal functions. Describe the golden section and Fibonacci algorithms for the minimization problems

$$\min_{x \in \Omega_2} f(x) \quad \text{and} \quad \min_{x \in \Omega_3} g(x).$$

Discuss the rate of decrease of the uncertainty domain, how many evaluations you need at each step and the stopping conditions!

Exercise 2.

Determine all the points $x_0 \in \mathbb{R}$ for which Newton's method for finding the root of the equation $\arctan(x) = 0$ converges. Prove the convergence of your algorithm for these points.

Exercise 3.

Exercises 7.7 and 7.8 from the book of Chong and Zak.

Exercise 4.

Exercise 8.1 from the book of Chong and Zak.