

# Math 164: Optimization – Homework 4

Due: October 21, 2016

## Exercise 1.

Exercises 20.9, 20.10, 20.17(a) and 20.18 from the book of Chong and Zak.

*Hint for 20.9:* a possibility is to introduce the constraint “denominator =  $\ell$ ”, then solve the problem, then optimize w.r.t.  $\ell > 0$ .

## Exercise 2.

Exercises 21.1, 21.2, 21.3 and 21.5 from the book of Chong and Zak.

## Exercise 3.

Exercises 21.9, 21.11, 21.12, 21.14 from the book of Chong and Zak.

## Exercise 4.

We expect that Newton’s algorithm to find the solution of the nonlinear equation

$$\arctan(x) = 0$$

is converging if the initial guess satisfies  $x^0 \in (-a, a)$  for some  $a > 0$ . Analyze the maximal range of this  $a > 0$ . Justify your answer!

## Exercise 5.

Read the subsections on the golden section and Fibonacci algorithms from the textbook, to see that there are also algorithms for which one does not need to assume any smoothness on the objective function. However, these algorithms have the drawback that they are hard (or almost impossible) to be generalized to higher dimension and general domains.

If you do not have a copy of the textbook, just let me know.