Övning 1

September 14, 2018

Exercise 1(Sauer 1.1.5). Consider the equation $x^4 = x^3 + 10$.
(a) Find an interval [a,b] of length two inside which the equation has a solution.
(b) Starting with [a,b], how many steps of Bisection method are required to calculate the solution within 10^{-10}? Answer with an integer.

Exercise 2(Sauer 1.1.6). Suppose that the Bisection method with starting interval $[-2, 1]$ is used to find a root of the function $f(x) = 1/x$. Does the method converge to a real number? Is it the root?

Exercise 3(Sauer 1.2.15). Which of the following FPIs converge to the $\sqrt{5}$?

(a) $x \to \frac{4}{5}x + \frac{1}{x}$ **(b)** $x \to \frac{x}{2} + \frac{5}{2x}$ **(c)** $x \to \frac{x+5}{x+1}$

Exercise 4(Sauer 1.4.2(a)). Apply two steps of Newton's method with an initial guess $x_0 = 1$ to the equation $x^3 + x^2 - 1 = 0$. Write a MATLAB script on paper to implement Newton's method to find the root within ten digits of accuracy.

Exercise 5(Sauer 1.4.11). Use Newton's method to produce a quadratically convergent method for calculating the n-th root of a positive number A, where n is a positive integer. Prove quadratic convergence.