



## Numerical Linear Algebra

---

### Prestudy No. 3 (Autumn 2014)

We are interested in solving the following problem

$$x = e^{-x}. \quad (1)$$

**Problem 3.1:** Which different ways to solve (1) come to your mind? What are the differences between those solution methods? What do they have in common?

**Problem 3.2:** Let us solve (1) numerically. We approximate the solution by a sequence  $x_1, x_2, \dots$  using the rule

$$x_{k+1} = e^{-x_k}. \quad (2)$$

Write a MATLAB program which implements (2). Think of a suitable start value for  $x_0$ . Print the values of  $k$  and  $x_k$  in a table. What do you observe? How accurate is the approximation? How accurate could it be?

**Problem 3.3:** The equation (1) can equivalently be written as

$$x = -\log x.$$

Formulate a similar approximation as (2). Write a program in MATLAB which implements your approximation. What is a good start value in this implementation? Print the values for  $k$  and  $x_k$  in a table again. Compare the result to the results you got before with iteration (2).

**Problem 3.4:** What is a good stopping criterion for the iterations you implemented? What is a good stopping criterion in general?

---

Send your solutions to [barbel@kth.se](mailto:barbel@kth.se) until October 11th, 2014.