Homework set 2: Due March 2 at 11:00 am.
Reduced credits, -20%, until March 9 at 11:00 am.

Note that matlab is now available on the i5 server.
When running matlab, use format long e.

1. Exercises 2.1, 2.2, 2.6, and 2.20 from the Deuflhard–Hohmann textbook.

2. Exercises 3.2 and 3.3.

3. (a) Construct a 5-by-3 matrix $A$ such that $A^T \ast A$ is singular when
    evaluated in double precision but the matrix $R$ in the $QR$ factorization of $A$ is invertible. Hint: run help qr in matlab.

(b) Write a matlab program which solves linear least squares problems via Householder transformations. Do not use column exchanges.

(c) Solve three least squares problems with your matrix $A$ and three different right hand sides $b$ using the normal equations, the Householder program written for problem 3b, the $QR$-factorization available in matlab, and the $A\backslash b$ feature in matlab. Comment on the results.

(d) Take 101 equidistant points on the interval $[0, 1]$, including the end points and find the best fit with a polynomial of degree 10 to the function $\exp(\sin(4 \ast t))$. Try the different methods and comment on the results. What are the condition numbers of the matrices you use in the different methods? Do they indicate the reliability of the methods. Maybe the method of problem 3.2 could help?