Homework for week 5

Appl. numer. meth. with Matlab, 2019/20 spring semester

Homework is for independent work at home. It must be submitted until the next computer lab. The detailed solutions can be submitted either on an A4 sheet of paper (printed or written) or in a pdf file (e.g. in an exported Matlab livescript) to rhorvath@math.bme.hu. Do not send Matlab files. Give explicit answers to the questions of the problems and evaluate the results.

1. (2p) (Matlab + manually) Give the QR decomposition of the matrix

$$A = \begin{bmatrix} 2 & 0 & 1 \\ 6 & 2 & 0 \\ -3 & -1 & -1 \end{bmatrix}$$

using Householder reflections. Give the Householder matrices and the Q and R matrices explicitly.

2. (2p) (Matlab + manually) Give the QR decomposition of the matrix

$$A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 3 & 0 \\ 0 & 4 & -1 \\ 0 & 0 & 1 \end{bmatrix}$$

using two appropriate Givens rotations.

3. (2p) (Matlab + manually) Solve the over-determined system Ax = b, where

$$A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 3 & 0 \\ 0 & 4 & -1 \\ 0 & 0 & 1 \end{bmatrix}$$

(from the previous problem) and $b = [1, 1, 1, 1]^T$ using the QR decomposition of the matrix A and by solving the normal equation.