

MATH 365 Homework #7

Due: Thursday, Mar. 22, 2012

1. Given the following coefficient matrix

$$A = \begin{pmatrix} 7.0605 & 9.5022 & 4.4559 & 1.19 \\ 0.3183 & 0.3445 & 6.4631 & 4.9836 \\ 2.7692 & 4.3874 & 7.0936 & 9.5974 \\ 0.4617 & 3.8156 & 7.5469 & 3.4039 \\ 0.9713 & 7.6552 & 2.7603 & 5.8527 \\ 8.2346 & 7.952 & 6.797 & 2.2381 \\ 6.9483 & 1.8687 & 6.551 & 7.5127 \\ 3.171 & 4.8976 & 1.6261 & 2.551 \end{pmatrix},$$

and the right-hand-side vector

$$b = \begin{pmatrix} 0.7585 \\ 0.5395 \\ 5.3080 \\ 7.7917 \\ 9.3401 \\ 1.2991 \\ 5.6882 \\ 4.6939 \end{pmatrix},$$

where $\ker(A) = 0$.

- (1.1) (20 points) Find the **NORMAL EQUATION** of the following least squares problem

$$\|b - Ax\|_2 = \min_{y \in \mathbb{R}^4} \|b - Ay\|_2.$$

- (1.2) (30 points) By means of “Cholesky Decomposition Method”, **write and run a real source code on the computer** to find the solution $x \in \mathbb{R}^4$ of the above least squares problem.

2. Without coding, use your calculator to find Householder QR Factorization of A if

- (2.1) (30 points)

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

(2.2) (20 points)

$$A = \begin{pmatrix} 1 & 1 \\ 2 & 3 \\ 2 & 1 \end{pmatrix}.$$

Note: In your homework, the right source code and the correct output results must be shown altogether in order to obtain full score.