# Homework 3, due to February 17, 2006

All exercise numbers refer to the book 'Numerical Linear Algebra" of Trefethen and Bau.

**Problem 1:** Solve exercise 7.1

**Problem 2:** Solve exercise 7.4

**Problem 3:** Solve exercise 9.1

**Problem 4:** Solve exercise 9.2

**Problem 3:** Solve exercise 10.1

**Problem 5:** Solve exercise 10.2

**Problem 6:** Solve exercise 10.3

**Problem 7:** Solve exercise 11.3

**Problem 8:** Write a Matlab function `[Q,R] = clgs(A)` that computes a reduced QR factorization $A = \hat{Q}\hat{R}$ of a real-valued $m \times n$ matrix $A$ with $m \geq n$ using the classical Gram Schmidt algorithm (whence `clgs`). The output variables are a matrix $\hat{Q} \in \mathbb{R}^{m\times n}$ with orthonormal columns and an upper triangular matrix $\hat{R} \in \mathbb{R}^{n\times n}$. Test your algorithm by applying it to a random matrix (generated via `randn`) and to the Hilbert matrix (generated via `hilb`) of size $10 \times 10, 50 \times 50$, and $100 \times 100$. Check the accuracy by computing $\|A - \hat{Q}\hat{R}\|_F$ and $\|\hat{Q}^*\hat{Q} - I\|_F$ (the latter tests orthogonality of $\hat{Q}$).