MATH 552 Numerical Linear Algebra Spring 2006

Homework Set 4 Due Thursday, 30 March 2006

1. Problem **6.4** from *Trefethen & Bau*.
2. Problem **6.5** from *Trefethen & Bau*.
3. Problem **7.3** from *Trefethen & Bau*.
4. Problem **7.4** from *Trefethen & Bau*.
5. Let $A \in \mathbb{C}^{m\times n}, m \geq n$, rank $A = n$.
   (a) Show that A^*A is invertible.
   (b) Let $P = A(A^*A)^{-1}A^*$. Show that $P^2 = P$, $P^* = P$, and range P = range A.
   (c) Show that $P = A(A^*A)^{-1}A^*$ reduces to $P = \hat{Q}\hat{Q}^*$, where $A = \hat{Q}\hat{R}$ is the reduced QR factorization of A.
6. Read Lecture 9, MATLAB. Write the M-files *clgs.m* and *mgs.m* to implement classical GS and modified GS, the subject of Experiment 2. Using your code, carry out the 'numerical' experiment described therein, which produces a plot similar to Figure 9.1. The MATLAB function *semilogy* will be useful here.

   Perform the experiment at least 10 times, observing your '9.1' plot. Include a copy of the plot that results from two instances. Discuss. Include a copy of your codes.