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 $A \in \mathbb{C}^{m \times n}, m \geq n, \text{rank } A = n$.
   (a) Show that $A^*A$ is invertible.
   (b) Let $P = A(A^*A)^{-1}A^*$. Show that $P^2 = P$, $P^* = P$, and range $P = \text{range } A$.
   (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.