Homework 4, Math222a:

Problem 1: Let A be an $m \times n$ matrix of rank k. Provided that m, n, k are as in the top row, please answer questions 1 through 6 in the table below.

	$m > n > k$	$m > n = k$	$m = n = k$	$m = n > k$	$n > m = k$	$n > m > k$
Q1:						
Q2:						
Q3:						
Q4:						
Q5:						
Q6:						

Q1: Is it the case that $\operatorname{span}(A) = \mathbb{R}^m$?
Q2: Is it the case that $A\boldsymbol{x} = \boldsymbol{b}$ always has a solution?
Q3: Is the map $\boldsymbol{x} \mapsto A\boldsymbol{x}$ onto?
Q4: Are the columns of A linearly independent?
Q5: Provided that $A\boldsymbol{x} = \boldsymbol{b}$ is consistent, is the solution unique?
Q6: Is the map $\boldsymbol{x} \mapsto A\boldsymbol{x}$ one-to-one?

Problem 2: Consider the map

$$T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} -x_1 \\ x_2 \end{bmatrix}.$$

- Is T linear?
- If T is linear, what is its standard matrix?
- Is T onto?
- Is T one-to-one?
- Make two sketches similar to Fig. 6 in ch. 1.8 showing the geometric action of T.

Also do:
Section 1.6: 6,8
Section 1.8: 6,20,26,32
Section 1.9: 6,8,10,24,30,36