

# MATH 3110 - Fall 2015

## Homework 4

Due: Thursday September 24

### Questions. Chapter 3 of Strang

(total of 20 marks)

- Write the  $3 \times 7$  matrix in rref with the largest number of 1 as entries. (2 marks)
  - Write the  $3 \times 7$  matrix in rref with the largest amount of 1 as entries and pivot columns 2 and 4. (2 marks)
- Answer the following questions. (4 marks)

(a) Find a matrix  $A$  such that the only solution of  $Ax = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$  is  $x = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$ .

(b) Show that it is not possible to find a matrix  $B$  such that the *only* solution of  $Bx = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$  is  $x = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$ .

- Compute rank and set of solutions (by finding a particular solution and the nullspace) of the systems: (12 marks)

1. 
$$\begin{pmatrix} 1 & 2 \\ 2 & 1 \\ 1 & 1 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} 8 \\ 7 \\ 5 \end{pmatrix}$$

2. 
$$\begin{pmatrix} 1 & 2 & 2 & 3 \\ 2 & 4 & 1 & 3 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 8 \\ 10 \end{pmatrix}$$

3. 
$$\begin{pmatrix} 1 & 2 & 1 \\ 2 & 1 & 0 \\ 1 & 1 & 3 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 8 \\ 6 \\ 10 \end{pmatrix}$$

4. 
$$\begin{pmatrix} 1 & 2 & 3 & 2 \\ 2 & 4 & 6 & 1 \\ 1 & 2 & 3 & 1 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 4 \\ 3 \\ 5 \end{pmatrix}$$