

MATH 3110 - Fall 2017**Homework 4**Due: Thursday September 28QUESTION 1. *Chapter 3 of Strang**(total of 30 marks)*

1. Compute the row reduced echelon form of the following matrices (6 marks)

$$A = \begin{pmatrix} 1 & 2 & 2 & 3 & 9 \\ 3 & 6 & 1 & 4 & 7 \\ 0 & 0 & 1 & 1 & 4 \end{pmatrix} \text{ and } B = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 2 & 3 & 3 \\ 4 & 1 & 1 \\ 1 & 2 & 3 \end{pmatrix}$$

2. Construct a matrix
- A
- such that
- $N(A)$
- contains all multiples of
- $\begin{pmatrix} 0 \\ 1 \\ 2 \\ 1 \end{pmatrix}$
- . (2 marks)

3. (a) Write the
- 3×7
- matrix in rref with the largest amount of entries equal 1. (2 marks)

- (b) Write the
- 3×7
- matrix in rref with the largest amount of entries equal 1 and pivot columns 2 and 4. (2 marks)

4. Answer the following questions. (6 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
- $x = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$
- .

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

$$\begin{array}{ll} 1. & \begin{pmatrix} 1 & 2 \\ 2 & 1 \\ 1 & 1 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} 8 \\ 7 \\ 5 \end{pmatrix} \\ 2. & \begin{pmatrix} 1 & 2 & 2 & 3 \\ 2 & 4 & 1 & 3 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 8 \\ 10 \end{pmatrix} \\ 3. & \begin{pmatrix} 1 & 2 & 1 \\ 2 & 1 & 0 \\ 1 & 1 & 3 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 8 \\ 6 \\ 10 \end{pmatrix} \\ 4. & \begin{pmatrix} 1 & 2 & 3 & 2 \\ 2 & 4 & 6 & 1 \\ 1 & 2 & 3 & 1 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 4 \\ 3 \\ 5 \end{pmatrix} \end{array}$$