

**MATH 3110 - Fall 2017****Homework 10**Due: Thursday November 9**QUESTION 1. Chapter 5 of Strang***(total of 14 marks)*

1. Compute the determinant of the following matrices (show the computations) and find a basis of their nullspaces. (10 marks)

(a) 
$$\begin{pmatrix} 1 & 2 & 5 \\ 2 & 4 & 10 \\ 1 & 0 & 2 \end{pmatrix}.$$

(c) 
$$\begin{pmatrix} 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 1 \end{pmatrix}$$

(b) 
$$\begin{pmatrix} 1 & 2 & 3 \\ 1 & 2 & 4 \\ 1 & 1 & 1 \end{pmatrix}$$

(d) 
$$\begin{pmatrix} 6 & 5 & 4 \\ 0 & 3 & 2 \\ 0 & 0 & 1 \end{pmatrix} - \begin{pmatrix} 1 & 0 & 0 \\ 2 & 3 & 0 \\ 4 & 5 & 6 \end{pmatrix}$$

2. Let  $A$  be a  $4 \times 4$  matrix with determinant 3. Compute the determinant of the following matrices. (4 marks)

(a)  $(3A)^{-1}$

(b)  $((A + A)^T - A^T) * A$

**QUESTION 2. Chapter 6.1 of Strang***(total of 16 marks)*

1. Compute the eigenvalues and the eigenvectors of the following matrices if possible. (16 marks)

(a)  $A = \begin{pmatrix} 5 & -2 \\ 4 & -1 \end{pmatrix}$

(c)  $C = \begin{pmatrix} 4 & 1 \\ -1 & 2 \end{pmatrix}$

(b)  $B = \begin{pmatrix} -3 & -3 & 6 \\ 6 & 6 & -6 \\ 0 & 0 & 3 \end{pmatrix}$

(d)  $D = \begin{pmatrix} \frac{1}{2} & -\frac{\sqrt{3}}{2} & 0 \\ \frac{\sqrt{3}}{2} & \frac{1}{2} & 0 \\ 0 & 0 & 1 \end{pmatrix}$