

**MATH 3110 - Fall 2016**

**Homework 10**

Due: Thursday November 3

QUESTION 1. *Chapter 5 of Strang*

(total of 10 marks)

1. Compute the determinant of the following matrices (show the computations) and find a basis of their nullspaces. (6 marks)

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

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

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

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 10 marks)

1. Compute the eigenvalues and the eigenvectors of the following matrices if possible. (10 marks)

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

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

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

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