

# MATH 3110 - Fall 2014

## Homework 9

Due: Thursday November 6

### Questions. Chapter 5.2 and 5.3 of Strang

(total of 10 marks)

1. Compute the following determinant of the matrix

(3 marks)

$$\begin{pmatrix} a & 0 & 0 & 0 & 0 & b \\ 0 & a & 0 & 0 & b & 0 \\ 0 & 0 & a & b & 0 & 0 \\ 0 & 0 & c & d & 0 & 0 \\ 0 & c & 0 & 0 & d & 0 \\ c & 0 & 0 & 0 & 0 & d \end{pmatrix}$$

2. Solve the equation

(4 marks)

$$\det \begin{pmatrix} 1 & x & x^2 & x^3 \\ 1 & 1 & 1 & 1 \\ 1 & 2 & 4 & 8 \\ 1 & 3 & 9 & 27 \end{pmatrix} = 0.$$

3. Show that the following determinant is equal to 0:

(3 marks)

$$\begin{vmatrix} 0 & 0 & 0 & a & b \\ 0 & 0 & 0 & c & d \\ 0 & 0 & 0 & e & f \\ p & q & r & s & t \\ v & w & x & y & z \end{vmatrix}$$

### Questions. Chapter 6.1 of Strang

(total of 10 marks)

1. If possible, compute the eigenvalues and eigenvectors of the following matrices

(10 marks)

(a)  $A_1 = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 2 & 1 \\ 0 & 0 & 3 \end{pmatrix}$

(c)  $A_3 = A_1^2 + 3I$

(b)  $A_2 = A_1^{-1}$

(d)  $A_4 = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{pmatrix}$