MATH 3110 - Fall 2014

Homework 8

Due: Thursday October 29

QUESTION 1. *Chapter 4.4 of Strang* *(total of 8 marks)*

1. Compute using Gram-Schmidt the orthonormal basis of $\mathbb{R}^4$ related to the following basis vectors

$$v_1 := \begin{pmatrix} 2 \\ 0 \\ 0 \\ -2 \end{pmatrix}, \; v_2 := \begin{pmatrix} 2 \\ 0 \\ 0 \\ 0 \end{pmatrix}, \; v_3 := \begin{pmatrix} 1 \\ 1 \\ 1 \\ 1 \end{pmatrix} \text{ and } v_4 := \begin{pmatrix} 0 \\ 2 \\ 0 \\ -2 \end{pmatrix}.$$

QUESTION 2. *Chapter 5.1 of Strang* *(total of 12 marks)*

1. Compute the determinant of the following matrices (show the computations) and in case of zero determinant find a linear combination of the columns of the matrix with some non zero coefficients which give the zero vector. (8 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 4×4 matrix with determinant 3. Compute the determinant of the following matrices. (4 marks)

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

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