Assignment Two (deadline 20 Feb)

Question 1

EXE 2 Question 8

(10 marks)

Question 2

Use the Gram-Schmidt process to find the orthonormal vectors for

$$\boldsymbol{a_1} = \begin{pmatrix} 1 \\ 3 \\ 5 \\ 9 \end{pmatrix}, \boldsymbol{a_2} = \begin{pmatrix} -1 \\ 4 \\ -1 \\ 3 \end{pmatrix}, \boldsymbol{a_3} = \begin{pmatrix} -1 \\ 1 \\ -1 \\ -1 \end{pmatrix}$$

(10 marks)

Question 3

Let $\boldsymbol{a_1} = \begin{pmatrix} 1 \\ -1 \\ 3 \end{pmatrix}; \boldsymbol{a_2} = \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}$

(a) Find all vectors $\boldsymbol{x}$ in such that $\boldsymbol{x} = t_1\boldsymbol{a_1} + t_2\boldsymbol{a_2}$ for some constants $t_1$and t_1.

(b) Is the vector $\begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}$ one of the vectors you found in part a?

(10 marks)

Question 4
→ EXE2 Question 24

(10 marks)

Question 5
Let $\boldsymbol{a_1} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}; \boldsymbol{a_2} = \begin{pmatrix} -1 \\ 1 \end{pmatrix}$
Describe the following sets of vectors (using a figure) and discuss whether the sets form a vector space or not.
Assume that we have conventional vector addition and scalar multiplication.

a. $\mathbb{A} = \{\boldsymbol{x} = t\boldsymbol{a_1} + (1-t)\boldsymbol{a_2} : 0 \leq t \leq 1\}$
b. $\mathbb{A} = \{\boldsymbol{x} = t_1\boldsymbol{a_1} + t_2\boldsymbol{a_2} : 0 \leq t_1 \leq 1, 0 \leq t_2 \leq 1\ \}$
c. $\mathbb{A} = \{\boldsymbol{x} = t\boldsymbol{a_1} + (1-t)\boldsymbol{a_2} : for\ any\ real\ t\}$

(30 marks)