Your name:

(first) (last)

All the calculations for the assignment should be attached to this sheet.

Question 1. Let

$$A = \begin{bmatrix} 4 & 4 & 2 & 3 & -2 \\ 0 & 1 & -2 & -2 & 2 \\ 6 & 12 & 11 & 2 & -4 \\ 9 & 20 & 10 & 10 & -6 \\ 15 & 28 & 14 & 5 & -3 \end{bmatrix}$$

- (a) Find all the eigenvalues for the matrix A using Matlab.
- (b) Find a basis for the eigenspace corresponding each of the eigenvalues.

Question 2. Let

$$A = \begin{bmatrix} 3 & 0 & 10\\ -4 & 1 & -8\\ 0 & 0 & -2 \end{bmatrix}$$

(a) Show that A is diagonalizable, and identify D and P in $A = PDP^{-1}$

(b) Let
$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = A^k \mathbf{b}$$
 where $\mathbf{b} = \begin{bmatrix} 1 \\ 3 \\ -2 \end{bmatrix}$. Express x_1 in terms of k .

Question 3. (A bonus question) Recall the matrix

$$A = \begin{bmatrix} 0.5 & 0.3 & 0.2 \\ 0.2 & 0.8 & 0 \\ 0.3 & 0.3 & 0.4 \end{bmatrix}$$

from Worksheet No.4.

- (a) Show that A is diagonalizable, and identify D and P in $A = PDP^{-1}$
- (b) Find $\lim_{n\to\infty}A^n$ and justify your answer by using the diagonalization.