MATH 3110 - Fall 2015

Homework 10

Due: Thursday November 12

QUESTION 1. *Chapter 6.1 and 6.2 of Strang* *(total of 20 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) $D = \begin{pmatrix} \frac{1}{2} & -\frac{\sqrt{3}}{2} & 0 \\ \frac{\sqrt{3}}{2} & \frac{1}{2} & 0 \\ 0 & 0 & 1 \end{pmatrix}$

2. Diagonalize matrix $A = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix}$ by finding the matrices S and Λ. (5 marks)

3. Diagonalize A and compute $S\Lambda^k S^{-1}$ to prove this formula for A^k (5 marks)

$$A = \begin{pmatrix} 2 & -1 \\ -1 & 2 \end{pmatrix} \quad \text{and} \quad A^k = \frac{1}{2}\begin{pmatrix} 1+3^k & 1-3^k \\ 1-3^k & 1+3^k \end{pmatrix}$$

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