MATH 307: Group Homework 7

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Problem 1

For all matrices, $A^{m\times n}$, in which all of the row sums $= 1$, the vector $v = \begin{pmatrix} 1 \\ 1 \\ \vdots \\ 1 \end{pmatrix}$ of dimension n is an eigenvector.

Proof:

$$Av = \lambda v$$

$$\begin{pmatrix} a_1^* \\ a_2^* \\ \vdots \\ a_n^* \end{pmatrix} \begin{pmatrix} 1 \\ 1 \\ \vdots \\ 1 \end{pmatrix} = \lambda \begin{pmatrix} 1 \\ 1 \\ \vdots \\ 1 \end{pmatrix}$$

All of the rows in A are equal to 1.

$$\begin{pmatrix} 1 \\ 1 \\ \vdots \\ 1 \end{pmatrix} \begin{pmatrix} 1 \\ 1 \\ \vdots \\ 1 \end{pmatrix} = \lambda \begin{pmatrix} 1 \\ 1 \\ \vdots \\ 1 \end{pmatrix}$$

Say $\lambda = 1$.

$$\begin{pmatrix} 1 \\ 1 \\ \vdots \\ 1 \end{pmatrix} = \lambda \begin{pmatrix} 1 \\ 1 \\ \vdots \\ 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 \\ 1 \\ \vdots \\ 1 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \\ \vdots \\ 1 \end{pmatrix}$$

Since there exists λ s.t. $Av = \lambda v$, v is an eigenvector with corresponding eigenvalue 1.

Problem 2

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Problem 3

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