Quiz #3 (CSE 4190.313)

Wednesday, May 11, 2016

Name: _____ **ID No:** _____

1. (10 points) Suppose $A = \mathbf{u}\ \mathbf{v}^T$ is a column times a row.
   (a) (3 points) Show that $\mathbf{u}$ is an eigenvector. What is λ?
   (b) (4 points) What are the other eigenvalues and eigenvectors of A? Explain why.
   (c) (3 points) Compute the trace of A from the sum of the diagonal and the sum of λ's.

2. (10 points) Find the rank and all four eigenvalues for the following matrix. Which eigenvectors correspond to nonzero eigenvalues?

$$A = \begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}.$$

3. (10 points) Suppose there is an epidemic in which every month half of those who are well become sick, and a quater of those who are sick become dead. Find the steady state for the corresponding Markov process

$$\begin{bmatrix} d_{k+1} \\ s_{k+1} \\ w_{k+1} \end{bmatrix} = \begin{bmatrix} 1 & 1/4 & 0 \\ 0 & 3/4 & 1/2 \\ 0 & 0 & 1/2 \end{bmatrix} \begin{bmatrix} d_k \\ s_k \\ w_k \end{bmatrix}$$

4. (10 points) Show that a Jordan block J is always similar to J^T.