Quiz #3 (CSE 4190.313)

Monday, May 14, 2018

Name: _____ **ID No:** _____

1. (10 points) Suppose that A and B are both $n \times n$ matrices.

   (a) (3 points) Show that AB and BA are similar if A is invertible.

   (b) (7 points) Construct a counter-example where AB and BA are not similar if neither A nor B is invertible.

2. (10 points) Which of the following three matrices cannot be diagonalized? Explain why.

$$A_1 = \begin{bmatrix} 2 & -2 \\ 2 & -2 \end{bmatrix}, \quad A_2 = \begin{bmatrix} 2 & 0 \\ 2 & -2 \end{bmatrix}, \quad A_3 = \begin{bmatrix} 2 & 0 \\ 2 & 2 \end{bmatrix}.$$

3. (10 points) Which of the following six matrices are similar? Justify your answer.

$$A_1 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}, A_2 = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}, A_3 = \begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}, A_4 = \begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}, A_5 = \begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}, A_6 = \begin{bmatrix} 0 & 1 \\ 0 & 1 \end{bmatrix}.$$