Quiz 3; Tuesday, September 13
MATH 54 with Ming Gu
GSI: Eric Hallman

Student name:

You have 15 minutes to complete the quiz. Calculators are not permitted.

1. (4 points) Let $A = \begin{bmatrix} 3 & 1 \\ 7 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -1 & 0 \\ -4 & 3 & 1 \end{bmatrix}$. Compute the following or state which don't exist.

   (a) AB

   $$AB = \begin{bmatrix} 2 & 0 & 1 \\ 6 & -1 & 2 \end{bmatrix}.$$

   (b) BA DOES NOT EXIST.

   (c) A^{-1}

   $$A^{-1} = \begin{bmatrix} -2 & 1 \\ 7 & -3 \end{bmatrix}.$$

   (d) An elementary row matrix E that swaps the rows of A

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

2. (4 points) Suppose A is a 4×7 matrix (i.e. 4 rows and 7 columns) and B is a 7×4 matrix. Of the four matrices A, B, AB, or BA, list **all** that could **possibly** represent a linear transformation that is...

   (a) one-to-one and onto: AB ONLY

   (b) one-to-one but not onto: B ONLY

   (c) neither one-to-one nor onto: ALL OF THEM

3. (4 points) Mark each statement as True or False. You do not have to explain your reasoning.

   (a) If A is an $n \times n$ matrix and $A\mathbf{x} = \mathbf{e}_j$ is consistent for every $j \in \{1, \ldots, n\}$ then A is invertible. TRUE

   (b) If A and B are invertible then AB is also invertible and $(AB)^{-1} = A^{-1}B^{-1}$. FALSE

   (c) If the columns of an $n \times n$ matrix A span $\mathbb{R}^n$ then the columns are linearly independent. TRUE

   (d) $B = A^{-1}$ if *and only if* $AB = BA$. FALSE