DSA 8420 Spring 2025
Homework 1

Due January 21, 2025

You may use a local or online calculator to check your answers, but be sure to show your work! Only partial credits will be given for Q2–Q4 if no intermediate step is shown.

1. (18 pts) For matrices

$$A = \begin{bmatrix} 8 & 7 & -1 \\ -5 & -3 & 8 \\ 4 & 2 & 6 \end{bmatrix}, \ B = \begin{bmatrix} 0 & 3 & -6 \\ 2 & 9 & -5 \\ 3 & 4 & 2 \end{bmatrix}$$

and for the vector $\boldsymbol{x} = (3, -1, 2)^1$ and $t = -2$, compute the following.

   a.) $A + B$

   b.) AB

   c.) $(BA)^T$

   d.) tA

   e.) $A\boldsymbol{x}$

   f.) $\boldsymbol{x}^T B$

2. (12 pts) Transform each of the following matrices to reduced row echelon form (RREF).

   a.)
$$A = \begin{bmatrix} 1 & -2 & 3 & 9 \\ -1 & 3 & 0 & -4 \\ 2 & -5 & 5 & 17 \end{bmatrix}$$

   b.)
$$B = \begin{bmatrix} 1 & 0 & -2 & 1 & 0 \\ 0 & -1 & -3 & 1 & 3 \\ -2 & -1 & 1 & -1 & 3 \\ 0 & 3 & 9 & 0 & -12 \end{bmatrix}$$

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[1]$\boldsymbol{x}$ is a column vector, but we write it with parentheses and commas so that it fits on a text line. When you compute with it, write it as a vertical stack in square brackets. If $\boldsymbol{x}$ were a row vector, we would write it $\boldsymbol{x} = \begin{bmatrix} 3 & -1 & 2 \end{bmatrix}$.

3. (5 pts) Let

$$A^{-1} = \begin{bmatrix} 3 & 2 \\ 1 & 3 \end{bmatrix}, \quad B^{-1} = \begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix}.$$

Find $(BA)^{-1}$.

4. (15 pts) Find the inverses of the given matrices.

a.) $\begin{bmatrix} 2 & -2 \\ 4 & 3 \end{bmatrix}$

b.) $\begin{bmatrix} 1 & 2 & 1 \\ 1 & 3 & -1 \\ 1 & 2 & 2 \end{bmatrix}$

c.) $\begin{bmatrix} 1 & 0 & 2 \\ 2 & 1 & -1 \\ 0 & 4 & 4 \end{bmatrix}$