MATH 201 Linear Algebra – Quiz 1C

Fall, 2025

Problem 1. Consider the matrices given below. Circle the matrices which are in **reduced row-echelon form**.

$$A = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{pmatrix} \qquad B = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{pmatrix} \qquad C = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$D = \begin{pmatrix} 1 & 0 & 0 & 5 & 0 \\ 0 & 1 & 0 & 4 & 0 \\ 0 & 0 & 1 & 3 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix} \qquad E = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

Problem 2. Consider the following system of linear equations.

$$\begin{aligned} 3x_4 + 2x_2 &= 5 \\ x_2 + 5x_3 - 10x_1 &= 0 \\ x_4 + x_2 &= 0. \end{aligned}$$

a) Write the augmented and coefficient matrices for the system.

b) Put the augmented matrix from part *a*) in RREF. Which variables, if any, are *free*?

c) *How many solutions* does the system have?

Problem 3. Write a matrix representing the **augmented matrix** of a system of 2 equations in 4 variables which has **no solutions**.

Problem 4. Let $A = \begin{pmatrix} 1 & 2 & 0 \\ 0 & 1 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & 2 & 1 \\ 0 & 0 & -1 \end{pmatrix}$. What is $2A - B$?

Problem 5. Let $M = \begin{pmatrix} 1 & 0 \\ 1 & 3 \end{pmatrix}$. Let $\vec{u} = \begin{pmatrix} 4 & 1 \end{pmatrix}$ and $\vec{v} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$.

a) What is $M\vec{u}$?

b) What is $M\vec{v}$?