

MATH 201 Linear Algebra – Quiz 1B

Fall, 2025

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

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

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

$$C = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 3 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$D = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 \end{pmatrix}$$

$$E = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

Problem 2. Consider the following system of linear equations.

$$\begin{aligned} x_3 + x_4 &= 0 \\ 3x_3 - 4x_4 &= 7 \\ x_1 + x_2 - x_3 &= 0 \\ x_1 + x_2 &= 0 \end{aligned}$$

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 3 equations in 4 variables which has **infinitely many solutions**.

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

Problem 5. Let $M = \begin{pmatrix} 1 & 0 & 2 \\ 0 & 3 & 1 \end{pmatrix}$. Let $\vec{u} = \begin{pmatrix} 4 \\ 1 \\ 3 \end{pmatrix}$ and $\vec{v} = (4 \ 1)$.

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

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