QUIZ 1 Math 304-06   Print your name _____
Sept. 1, 2023

   Circle your answer(s) to each question. There may be more than one correct answer; circle every one you think is correct. Use the back of the paper for any necessary work.
   No consultation!—that includes no electronics.

(1) We have a matrix $A = \begin{bmatrix} \mathbf{a}_1 & \mathbf{a}_2 & \cdots & \mathbf{a}_n \end{bmatrix}$ and a vector $\mathbf{b} = \begin{bmatrix} b_1 \\ b_2 \\ \vdots \\ b_n \end{bmatrix}$. The product $A\mathbf{b} =$

   NO $b_1\mathbf{a}_1 + b_2\mathbf{a}_2 + b_3\mathbf{a}_3$

   YES $b_1\mathbf{a}_1 + b_2\mathbf{a}_2 + \cdots + b_n\mathbf{a}_n$

   YES $\sum_{i=1}^{n} b_i\mathbf{a}_i$

   NO $b_1\mathbf{a}_1 + b_2\mathbf{a}_2 + b_n\mathbf{a}_n$

(2) Which of these matrices is (or are) in reduced row echelon form?

$\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ $\begin{bmatrix} 1 & 2 \\ 0 & 3 \\ 0 & 1 \end{bmatrix}$ $\begin{bmatrix} 1 & 2 \\ 0 & 1 \\ 0 & 0 \end{bmatrix}$ $\begin{bmatrix} 0 & 0 & 1 & 2 \end{bmatrix}$ $\begin{bmatrix} 1 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$ $\begin{bmatrix} 0 & 1 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$ $\begin{bmatrix} 0 & 0 \\ 1 & 2 \\ 0 & 0 \end{bmatrix}$ *None*

   Answers: ## 1, 4, 5, 6. Not ## 2, 3, 7.

(3) Circle each matrix that is row equivalent to $A = \begin{bmatrix} 2 & 6 & 8 \\ 3 & 9 & 12 \end{bmatrix}$. (There is at least one.)

$\begin{bmatrix} 0 & 2 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ $\begin{bmatrix} 0 & 0 & 0 \\ 1 & 3 & 4 \end{bmatrix}$ $\begin{bmatrix} 1 & 3 & 4 \\ 2 & 6 & 8 \end{bmatrix}$ $\begin{bmatrix} 1 & 3 & 4 \end{bmatrix}$

   Answers: ## 2, 3. Not ## 1,4. (You cannot throw away rows for row equivalence.)

         TURN OVER!

(4) Which of these four potential solutions is/are really a solution to the following linear system?

$$2x_1 - 4x_2 + x_4 = 0$$
$$3x_1 + x_2 + x_3 - 10x_4 = 1$$

The potential solutions:

$$\mathbf{x} = \begin{bmatrix} 2 \\ 0 \\ 7 \\ -4 \end{bmatrix} \qquad\qquad \mathbf{x} = \begin{bmatrix} 2 \\ 0 \\ -45 \\ -4 \end{bmatrix}$$

$x_1 = 2, x_2 = 0, x_3 = 7, x_4 = -4$ $\qquad\qquad$ $x_1 = 2, x_2 = 0, x_3 = -45, x_4 = -4$

Answer: The two on the right. By testing the numbers in the linear system, you find that the left candidates lose the election, but the right candidates win the election. Worse, both on the right are the same candidate in different clothing. And both on the left are also the same candidate.