Exam

Name_____

1) Let A be a 9 x 9 matrix and the system Ax = b has a unique solution for each 9 x 1 vector b. Then which one is **false** 1) _____

A) A is a square matrix

B) The reduced row echelon form of A is 9 x 9 identity matrix

C) A is invertible

D) The system Ax = 0 has only zero solution

E) The augmented matrix in solving Ax = b is 9 x 9

2) Let a and b nonzero numbers. Solve the following system: (find x and y) 2) _____

$$\begin{cases} \frac{a}{x} - \frac{b}{y} = 0 \\ \frac{a\,b^2}{x} + \frac{a^2\,b}{y} = a^2 + b^2 \end{cases}$$

A) $x = -3a,\ y = \frac{-5b}{2}$

B) $x = a,\ y = b$

C) $x = 5a,\ y = \frac{-3b}{2}$

D) $x = 2a,\ y = \frac{b}{2}$

E) $x = \frac{-5a}{2},\ y = \frac{-7b}{2}$

3) Which one of the following is **true** 3) _____

A) A matrix in row echelon form is already in reduced row echelon form

B) A linear system may have exactly five solutions

C) The zero matrix is in the reduced row echeleon form

D) A homogeneous system may have no solution

E) A consistent system may have no solution

4) Let C and D be invertible matrices. Which one of the following is **false** $\left(C^T : \text{transpose of } C\right)$ 4) _____

A) C must be a square matrix

B) $(9C)^{-1} = 9\,C^{-1}$

C) $\left(C^{-1}\right)T = \left(C^T\right)^{-1}$

D) $C^0 = I$, where I is the identity matrix

E) $(CD)^{-1} = D^{-1}\,C^{-1}$

5) Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix}$. Then the sum of (1, 1) and (1, 2) entries in A^{-2} is : 5) _____

A) 19 B) 13 C) 27 D) 15 E) 25

6) If B is m x m matrix that is not invertible, then the linear system $Bx = 0$ has 6) _____

A) no solution

B) unique nonzero solution

C) exactly five solutions

D) infinitely many solutions

E) unique zero solution

7) We are given the following system: 7) _____

$$\begin{cases} x - y = 1 \\ 3x - 3y = 3 \end{cases}$$

Geometric meaning of the solution to the given system is:

A) the lines represented by the equations in the system intersect at single point
B) the lines represented by the equations in the system intersect at ten points
C) the lines represented by the equations in the system intersect at no points
D) the lines represented by the equations in the system intersect at infinitely many points
E) the lines represented by the equations in the system intersect at three points

8) Let A and B be two symmetric matrices of the same size. Which one of the following is **false** $\left(A^T : \text{transpose of } A\right)$ 8) _____

A) $A + B$ is symmetric
B) $5A$ is symmetric
C) $A - B$ is symmetric
D) A^T is symmetric
E) AB is symmetric

9) What condition, if any, must a, b, and c satisfy for the linear system to be **consistent**? 9) _____

$$\begin{cases} x_1 - x_2 + x_3 = a \\ 2x_1 + 2x_3 = b \\ 4x_2 = c \end{cases}$$

A) a, b, c are any real numbers.
B) $a + 3b - c = 0$
C) $a + b + c = 0$
D) $b - a - c = 0$
E) $b - 2a - \frac{c}{2} = 0$

10) Let $(7A)^{-1} = \begin{bmatrix} -3 & 7 \\ 1 & -2 \end{bmatrix}$. Then (1, 1) entry in A is 10) _____

A) $\frac{2}{7}$ B) 7 C) $-\frac{3}{7}$ D) - 49 E) $\frac{1}{2}$

11) For which value of a, the following augmented matrix corresponds to an **inconsistent** system 11) _____

$$\begin{bmatrix} 1 & a & -2 \\ 6 & 6 & 10 \end{bmatrix}$$

A) 1 B) 22 C) - 2 D) - 4 E) 6

12) Let A be 4 x 5, B be 4 x 5, C be 5 x 2, D be 2 x 4 matrices. Then which one of the following operations is **defined**: (I is 5 x 5 identity matrix) 12) _____

A) A + B + D
B) 5DC
C) A + B + C + I
D) 2 C D A + I
E) C B + 5I

13) Which one is **not** in row echelon form: 13) _____

A) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ B) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ C) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ D) $\begin{bmatrix} 1 & 3 & 7 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{bmatrix}$ E) $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$

14) What condition, if any, must a, b, and c satisfy for the linear system to be **consistent**? 14) _____

$$\begin{cases} x + 2y - 3z = a \\ 2x + 3y + 3z = b \\ 5x + 9y - 6z = c \end{cases}$$

A) $a + b + c = 0$
B) $3a + b - c = 0$
C) $a + b - 3c = 0$
D) $2a + 3b + 4c = 0$
E) a, b, c are any real numbers.

15) Let $F = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 7 & 0 \\ 0 & 0 & 0 & 9 \end{bmatrix}$. Which one of the following is **false** 15) _____

A) F is a diagonal matrix
B) F is a symmetric matrix
C) F is a lower triangular matrix
D) F is invertible
E) F is an upper triangular matrix