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**Grade** 28.00 out of 30.00 (93%)

**Question 1**

Correct

Mark 1.00 out of 1.00

An  $n \times n$  matrix  $A$  is invertible if and only if

Select one:

- a.  $|A| = 0$
- b.  $Ax = 0$  has a nonzero solution
- c.  $A = I$
- d. there exists a matrix  $B$  such that  $AB = I$



The correct answer is: there exists a matrix  $B$  such that  $AB = I$

**Question 2**

Correct

Mark 1.00 out of 1.00

$(0, 0, 0)^T$  is a linear combination of the vectors  $(1, 2, 3)^T$ ,  $(1, 4, 1)^T$ ,  $(2, 3, 1)^T$

Select one:

- a. True ✓
- b. False

The correct answer is: True

**Question 3**

Correct

Mark 1.00 out of 1.00

In the  $n \times n$ -linear system  $Ax = b$ , if  $A$  is singular and  $b$  is a linear combination of the columns of  $A$  then the system has

Select one:

- a. exactly two solutions
- b. no solution
- c. a unique solution
- d. infinitely many solutions ✓

The correct answer is: infinitely many solutions

**Question 4**

Correct

Mark 1.00 out of 1.00

If  $y, z$  are solutions to  $Ax = b$ , then  $y + z$  is a solution of the system  $Ax = 0$ .

Select one:

- a. True
- b. False ✓

The correct answer is: False

**Question 5**

Incorrect

Mark 0.00 out of 1.00

Any two  $n \times n$ -singular matrices are row equivalent.

Select one:

- a. False
- b. True ✘

The correct answer is: False

**Question 6**

Correct

Mark 1.00 out of 1.00

If  $A$  is a  $4 \times 3$ -matrix,  $b \in \mathbb{R}^4$ , and the system  $Ax = b$  is consistent, then  $Ax = b$  has a unique solution.

Select one:

- a. True
- b. False ✔

The correct answer is: False

**Question 7**

Correct

Mark 1.00 out of 1.00

If  $(A|b) = \left( \begin{array}{ccc|c} 1 & 2 & -1 & 0 \\ 2 & 3 & 1 & -1 \\ 1 & 1 & \alpha & \beta \end{array} \right)$ , then the system has only one solution if

Select one:

- a.  $\alpha \neq 2$  and  $\beta$  any number ✔
- b.  $\alpha \neq 2$  and  $\beta \neq -1$
- c.  $\alpha = 2$  and  $\beta = -1$
- d.  $\alpha = 2$  and  $\beta \neq -1$

The correct answer is:  $\alpha \neq 2$  and  $\beta$  any number**Question 8**

Correct

Mark 1.00 out of 1.00

If  $A$  is a nonsingular  $3 \times 3$ -matrix, then the reduced row echelon form of  $A$  has no row of zeros.

Select one:

- a. False
- b. True ✔

The correct answer is: True

**Question 9**

Correct

Mark 1.00 out of 1.00

If  $E$  is an elementary matrix then one of the following statements is not true

Select one:

- a.  $E^{-1}$  is an elementary matrix.
- b.  $E$  is nonsingular.
- c.  $E^T$  is an elementary matrix.
- d.  $E + E^T$  is an elementary matrix. ✔

The correct answer is:  $E + E^T$  is an elementary matrix.

**Question 10**

Correct

Mark 1.00 out of 1.00

If  $A$  is a  $3 \times 3$  matrix with  $\det(A) = -2$ . Then  $\det(\text{adj}(A)) =$

Select one:

- a. 4. ✓
- b.  $-4$ .
- c.  $-8$ .
- d. 8.

The correct answer is: 4.

**Question 11**

Correct

Mark 1.00 out of 1.00

If  $A$  is singular and  $B$  is nonsingular  $n \times n$ -matrices, then  $AB$  is

Select one:

- a. singular ✓
- b. may or may not be singular
- c. nonsingular

The correct answer is: singular

**Question 12**

Correct

Mark 1.00 out of 1.00

If  $(A|b) = \left( \begin{array}{ccc|c} 1 & 1 & 2 & 4 \\ 2 & -1 & 2 & 6 \\ 1 & 1 & 2 & 5 \end{array} \right)$ , then the system  $Ax = b$  is inconsistent

Select one:

- a. True ✓
- b. False

The correct answer is: True

**Question 13**

Correct

Mark 1.00 out of 1.00

If  $A$  is a singular  $n \times n$ -matrix,  $b \in \mathbb{R}^n$ , then the system  $Ax = b$

Select one:

- a. has either no solution or an infinite number of solutions ✓
- b. has infinitely many solutions.
- c. has a unique solution
- d. is inconsistent

The correct answer is: has either no solution or an infinite number of solutions

**Question 14**

Correct

Mark 1.00 out of 1.00

If  $A$  is symmetric and skew symmetric then  $A = 0$ . ( $A$  is skew symmetric if  $A = -A^T$ ).

Select one:

- a. True ✓
- b. False

The correct answer is: True

**Question 15**

Correct

Mark 1.00 out of 1.00

If  $A = LU$  is the  $LU$ -factorization of a matrix  $A$ , and  $A$  is singular, then

Select one:

- a.  $L$  and  $U$  are both singular
- b.  $U$  is singular and  $L$  is nonsingular ✓
- c.  $L$  and  $U$  are both nonsingular
- d.  $L$  is singular and  $U$  is nonsingular

The correct answer is:  $U$  is singular and  $L$  is nonsingular

**Question 16**

Correct

Mark 1.00 out of 1.00

If  $A$  and  $B$  are singular matrices, then  $A + B$  is also singular.

Select one:

- a. False ✓
- b. True

The correct answer is: False

**Question 17**

Correct

Mark 1.00 out of 1.00

If  $A$  is a singular matrix, then  $A$  can be written as a product of elementary matrices.

Select one:

- a. False ✓
- b. True

The correct answer is: False

**Question 18**

Correct

Mark 1.00 out of 1.00

Let  $(1, 2, 0)^T$  and  $(2, 1, 1)^T$  be the first two columns of a  $3 \times 3$  matrix  $A$  and  $(1, 1, 1)^T$  be a solution of the system  $Ax = (4, 4, 5)^T$ . Then the third column of the matrix  $A$  is

Select one:

- a.  $(1, 1, 4)^T$ . ✓
- b.  $(4, -1, 1)^T$ .
- c.  $(-1, -1, -4)^T$ .
- d.  $(-1, -2, 1)^T$ .

The correct answer is:  $(1, 1, 4)^T$ .

**Question 19**

Correct

Mark 1.00 out of 1.00

Let  $A$  be a  $3 \times 4$  matrix which has a row of zeros, and let  $B$  be a  $4 \times 4$  matrix, then  $AB$  has a row of zeros.

Select one:

- a. True ✓
- b. False

The correct answer is: True

**Question 20**

Correct

Mark 1.00 out of 1.00

Let  $A$  be a  $4 \times 4$ -matrix such that  $A \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$ , then

Select one:

- a. There are elementary matrices  $E_1, E_2, \dots, E_k$  such that  $A = E_1 E_2 \dots E_k$
- b.  $A$  is the zero matrix
- c. The system  $Ax = 0$  has only one solution
- d.  $A$  is singular.



The correct answer is:  $A$  is singular.

**Question 21**

Correct

Mark 1.00 out of 1.00

If  $E$  is an elementary matrix of type III, then  $E^T$  is

Select one:

- a. an elementary matrix of type I
- b. an elementary matrix of type II
- c. not an elementary matrix
- d. an elementary matrix of type III



The correct answer is: an elementary matrix of type III

**Question 22**

Correct

Mark 1.00 out of 1.00

Let  $A = \begin{pmatrix} 1 & -1 & 1 \\ 3 & -2 & 2 \\ -2 & -1 & 3 \end{pmatrix}$ , then  $\det(A) =$

Select one:

- a. 2
- b. 3
- c. 5
- d. 0



The correct answer is: 2

**Question 23**

Correct

Mark 1.00 out of 1.00

If the row echelon form of  $(A|b)$  is  $\left(\begin{array}{cccc|c} 1 & 0 & -2 & -1 & -2 \\ 0 & 1 & 1 & -1 & -1 \\ 0 & 0 & 1 & 1 & 0 \end{array}\right)$  then the general form of the solutions is given by

Select one:

- a.  $x = \begin{pmatrix} -2 - \alpha \\ 1 - \alpha \\ \alpha \\ \alpha \end{pmatrix}$
- b.  $x = \begin{pmatrix} -2 - \alpha \\ 1 - \alpha \\ \alpha \\ 1 \end{pmatrix}$
- c.  $x = \begin{pmatrix} -2 - \alpha \\ -1 + 2\alpha \\ -\alpha \\ \alpha \end{pmatrix}$
- d.  $x = \begin{pmatrix} \alpha \\ 2 - \alpha \\ \alpha \\ \alpha \end{pmatrix}$

The correct answer is:  $x = \begin{pmatrix} -2 - \alpha \\ -1 + 2\alpha \\ -\alpha \\ \alpha \end{pmatrix}$

**Question 24**

Correct

Mark 1.00 out of 1.00

If  $A, B$  are  $n \times n$ -skew-symmetric matrices ( $A$  is skew symmetric if  $A^T = -A$ ), then  $AB + BA$  is symmetric

Select one:

- a. True ✓
- b. False

The correct answer is: True

**Question 25**

Correct

Mark 1.00 out of 1.00

Let  $A$  be a  $4 \times 3$ -matrix with  $a_2 - a_3 = 0$ . If  $b = a_1 + a_2 + a_3$ , where  $a_j$  is the  $j$ th column of  $A$ , then the system  $Ax = b$  will have infinitely many solutions.

Select one:

- a. False
- b. True ✓

The correct answer is: True

**Question 26**

Correct

Mark 1.00 out of 1.00

If  $A$  is a  $3 \times 3$ -matrix and the system  $Ax = \begin{pmatrix} 5 \\ 1 \\ 3 \end{pmatrix}$  has a unique solution, then the system  $Ax = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$

Select one:

- a. is inconsistent
- b. has only the zero solution. ✓
- c. has infinitely many solutions

The correct answer is: has only the zero solution.

**Question 27**

Incorrect

Mark 0.00 out of 1.00

If  $AB = 0$ , where  $A$  and  $B$  are  $n \times n$  nonzero matrices. Then

Select one:

- a. either  $A$  or  $B$  is singular  
✗
- b. both  $A, B$  are singular.
- c. both  $A, B$  are nonsingular.
- d. either  $A = 0$  or  $B = 0$

The correct answer is: both  $A, B$  are singular.**Question 28**

Correct

Mark 1.00 out of 1.00

If  $x_0$  is a solution of the nonhomogeneous system  $Ax = b$  and  $x_1$  is a solution of the homogeneous system  $Ax = 0$ . Then  $x_1 + x_0$  is a solution of

Select one:

- a. the system  $Ax = 0$
- b. the system  $Ax = 2b$
- c. the system  $Ax = Ab$
- d. the system  $Ax = b$   
✓

The correct answer is: the system  $Ax = b$ **Question 29**

Correct

Mark 1.00 out of 1.00

If  $A$  is a nonsingular  $n \times n$  matrix,  $b \in \mathbb{R}^n$ , then

Select one:

- a. The system  $Ax = b$  is inconsistent
- b. The system  $Ax = b$  has only two solutions
- c. The system  $Ax = b$  has a unique solution  
✓
- d. The system  $Ax = b$  has infinitely many solutions

The correct answer is: The system  $Ax = b$  has a unique solution

Question 30

Correct

Mark 1.00 out of 1.00

The adjoint of the matrix  $\begin{pmatrix} -1 & 2 \\ 1 & 3 \end{pmatrix}$  is

Select one:

- a.  $\begin{pmatrix} -1 & 1 \\ 2 & -3 \end{pmatrix}$
- b.  $\begin{pmatrix} 1 & -2 \\ -1 & -3 \end{pmatrix}$
- c.  $\begin{pmatrix} 3 & -2 \\ -1 & -1 \end{pmatrix}$
- d.  $\begin{pmatrix} 1 & 1 \\ 2 & 3 \end{pmatrix}$

The correct answer is:  $\begin{pmatrix} 3 & -2 \\ -1 & -1 \end{pmatrix}$

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