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Grade	**24.00** out of 30.00 (**80**%)

Question **1**
Correct
Mark 1.00 out of 1.00

If A, B, C are 3×3-matrices, $\det(A) = 9, \det(B) = 2, \det(C) = 3$, then $\det(3C^T BA^{-1}) =$

Select one:
- a. 6
- b. 16
- c. 18 ✔
- d. 2

The correct answer is: 18

Question **2**
Correct
Mark 1.00 out of 1.00

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

Select one:
- a. 1 ✔
- b. 9
- c. 7
- d. 0

The correct answer is: 1

Question **3**
Correct
Mark 1.00 out of 1.00

The adjoint of the matrix $\begin{pmatrix} 4 & 1 \\ 2 & -1 \end{pmatrix}$ is

Select one:
- a. $\begin{pmatrix} -1 & -1 \\ -2 & 4 \end{pmatrix}$ ✔
- b. $\begin{pmatrix} -1 & -2 \\ -3 & -5 \end{pmatrix}$
- c. $\begin{pmatrix} 4 & -1 \\ -2 & -1 \end{pmatrix}$
- d. $\begin{pmatrix} -1 & 2 \\ 1 & -4 \end{pmatrix}$

The correct answer is: $\begin{pmatrix} -1 & -1 \\ -2 & 4 \end{pmatrix}$

Question **4**

Correct

Mark 1.00 out of 1.00

If $A = \begin{pmatrix} 1 & 4 & -1 \\ 2 & 9 & 2 \\ -3 & -12 & 3 \end{pmatrix}$ then the lower triangular matrix L in the LU-facrorization of A is given by

Select one:

a. $L = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -3 & 0 & 1 \end{pmatrix}$ ✔

b. $L = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -3 & 0 & 0 \end{pmatrix}$

c. $L = \begin{pmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ 3 & 0 & 1 \end{pmatrix}$

d. $L = \begin{pmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ 3 & 0 & 0 \end{pmatrix}$

The correct answer is: $L = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -3 & 0 & 1 \end{pmatrix}$

Question **5**

Correct

Mark 1.00 out of 1.00

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

Select one:

a. True

b. False ✔

The correct answer is: False

Question **6**

Correct

Mark 1.00 out of 1.00

If A is a nonsingular and symmetric matrix, then

Select one:

a. A^{-1} is singular and symmetric

b. A^{-1} is singular and not symmetric

c. A^{-1} is nonsingular and symmetric ✔

d. A^{-1} is nonsingular and not symmetric

The correct answer is: A^{-1} is nonsingular and symmetric

Question **7**

Correct

Mark 1.00 out of 1.00

If $AB = AC$, and $|A| \neq 0$, then

Select one:

a. $B \neq C$

b. $A = 0$

c. $A = C$

d. $B = C$.

The correct answer is: $B = C$.

Question **8**

Incorrect

Mark 0.00 out of 1.00

If A, B are $n \times n$ symmetric matrices then AB is symmetric.

Select one:

a. False

b. True

The correct answer is: False

Question **9**

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. False

b. True

The correct answer is: False

Question **10**

Correct

Mark 1.00 out of 1.00

Let $A = \begin{pmatrix} 1 & 1 & 0 \\ 1 & a & 1 \\ 1 & 1 & 2 \end{pmatrix}$. the value(s) of a that make A nonsingular

Select one:

a. $a \neq \frac{1}{2}$

b. $a = 1$

c. $a = \frac{1}{2}$

d. $a \neq 1$

The correct answer is: $a \neq 1$

Question **11**

Incorrect

Mark 0.00 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 **12**

Correct

Mark 1.00 out of 1.00

If A is a singular matrix, then A^T is also singular.

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 4×3-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 **14**

Correct

Mark 1.00 out of 1.00

If A is a 4×4-matrix and $x = \begin{pmatrix} 2 \\ 3 \\ 0 \\ 1 \end{pmatrix}$ is a solution to the system $Ax = 0$, then A is singular.

Select one:

- a. False
- b. True ✔

The correct answer is: True

Question **15**

Correct

Mark 1.00 out of 1.00

If A and B are $n \times n$ matrices such that $Ax \neq Bx$ for all nonzero $x \in \mathbb{R}^n$. Then

Select one:

- a. $A - B$ is singular.
- b. A and B are nonsingular.
- c. $A - B$ is nonsingular. ✔
- d. A and B are singular.

The correct answer is: $A - B$ is nonsingular.

Question **16**

Correct

Mark 1.00 out of 1.00

If $A = \begin{pmatrix} 1 & -2 & 5 \\ 4 & -11 & 8 \\ -3 & 3 & -27 \end{pmatrix}$ and $b = \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix}$, then the system $Ax = b$ is consistent if and only if

Select one:

- a. $7b_1 - b_2 + b_3 \neq 1$
- b. $7b_1 - b_2 + b_3 \neq 0$
- c. $7b_1 - b_2 + b_3 = 1$
- d. $7b_1 - b_2 + b_3 = 0$ ✔

The correct answer is: $7b_1 - b_2 + b_3 = 0$

Question **17**

Correct

Mark 1.00 out of 1.00

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

Select one:

- a. False
- b. True ✔

The correct answer is: True

Question **18**

Correct

Mark 1.00 out of 1.00

A square matrix A is nonsingular iff its RREF (reduced row echelon form) is the identity matrix.

Select one:

- a. True ✔
- b. False

The correct answer is: True

Question **19**

Correct

Mark 1.00 out of 1.00

If the row echelon form of $(A|b)$ is $\begin{pmatrix} 1 & 0 & -2 & -1 & | & -2 \\ 0 & 1 & 1 & -1 & | & -1 \\ 0 & 0 & 1 & 1 & | & 0 \end{pmatrix}$ 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. $x = \begin{pmatrix} -2-\alpha \\ -1+2\alpha \\ -\alpha \\ \alpha \end{pmatrix}$ ✔
- c. $x = \begin{pmatrix} \alpha \\ 2-\alpha \\ \alpha \\ \alpha \end{pmatrix}$
- d. $x = \begin{pmatrix} -2-\alpha \\ 1-\alpha \\ \alpha \\ 1 \end{pmatrix}$

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

Question **20**

Incorrect

Mark 0.00 out of 1.00

If A is a 3×3 matrix with $\det(A) = -1$. Then $\det(adj(A)) =$

Select one:

- a. 3. ✖
- b. 1.
- c. -1.
- d. -3.

The correct answer is: 1.

Question **21**

Correct

Mark 1.00 out of 1.00

If A is a 3×3 matrix such that $det(A) = 2$, then $\det(3A) = 6$

Select one:

- a. True
- b. False ✔

The correct answer is: False

Question **22**

Correct

Mark 1.00 out of 1.00

If A is a 3×5 matrix, then the system $Ax = 0$

Select one:

- a. is inconsistent
- b. has infinitely many solutions ✔
- c. has no solution.
- d. has only the zero solution

The correct answer is: has infinitely many solutions

Question **23**

Correct

Mark 1.00 out of 1.00

Let U be an $n \times n$-matrix in reduced row echelon form and $U \neq I$, then

Select one:

- a. $\det(U) = 1$
- b. The system $Ux = 0$ has only the zero solution.
- c. U is the zero matrix
- d. The system $Ux = 0$ has infinitely many solutions ✔

The correct answer is: The system $Ux = 0$ has infinitely many solutions

Question **24**

Incorrect

Mark 0.00 out of 1.00

Let A be a 3×3-matrix with $a_1 = a_2$. If $b = a_2 - a_3$, where a_1, a_2, a_3 ar the columns of A, then a solution to the system $Ax = b$ is

Select one:

- a. $x = \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}$
- b. $x = \begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix}$ ✘
- c. $x = \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix}$
- d. $x = \begin{pmatrix} 0 \\ 0 \\ 2 \end{pmatrix}$

The correct answer is: $x = \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}$

Question **25**

Correct

Mark 1.00 out of 1.00

If A is an $n \times n$ matrix and the system $Ax = b$ has infinitely many solutions, then

Select one:

a. A is nonsingular

b. A has a row of zeros

c. A is symmetric

d. A singular ✔

The correct answer is: A singular

Question **26**

Correct

Mark 1.00 out of 1.00

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

Select one:

a. A is the zero matrix

b. A is singular. ✔

c. The system $Ax = 0$ has only one solution

d. There are elementary matrices $E_1, E_2, \cdots, E_k$ such that $A = E_1 E_2 \cdots E_k$

The correct answer is: A is singular.

Question **27**

Incorrect

Mark 0.00 out of 1.00

If B is a 3×3 nonsingular matrix such that $B^3 = B$, then one of the following is always true

Select one:

a. $B^4 = B$.

b. det$(B) = 1$. ✖

c. $B = 0$.

d. $B = B^{-1}$.

The correct answer is: $B = B^{-1}$.

Question **28**

Incorrect

Mark 0.00 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. is inconsistent

b. has a unique solution ✖

c. has infinitely many solutions.

d. has either no solution or an infinite number of solutions

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

Question **29**

Correct

Mark 1.00 out of 1.00

Let $A = \begin{pmatrix} 1 & 2 & 3 & 0 \\ 1 & 1 & 2 & 1 \\ 2 & 3 & 5 & 1 \end{pmatrix}$ and $b = \begin{pmatrix} 2 \\ 1 \\ 4 \end{pmatrix}$. The system $Ax = b$

Select one:

- a. has exactly three solutions.
- b. has a unique solution
- c. is inconsistent ✔
- d. has infinitely many solutions

The correct answer is: is inconsistent

Question **30**

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 3×3 matrix A and $(1, 1, 1)^T$ be a solution of the system $Ax = (2, 1, -1)^T$. Then the third column of the matrix A is

Select one:

- a. $(1, 2, 2)^T$.
- b. $(-1, -2, -2)^T$. ✔
- c. $(4, -1, 1)^T$.
- d. $(1, 1, 0)^T$.

The correct answer is: $(-1, -2, -2)^T$.

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