

Topic Test: Linear Algebra

1 Solve the system of equations and find $(x + y + z)$:

$$3x + y - z = 12$$

$$4x - y + 2z = 13$$

$$-10x + 4y - 3z = -14$$

- A) 10 B) 11 C) 14
D) inconsistent E) NOTA

2 Find $\begin{vmatrix} 2 & -5 & 3 \\ -9 & 1 & 7 \\ 0 & -1 & 10 \end{vmatrix}$

- A) -417 B) -389 C) 429
D) 457 E) NOTA

3 Solve the system: $2x + 5y + z = -6$
 $3x - y - z = -10$ Find $x + y + z$
 $x - 2y + 2z = -12$

- A) 8 B) 1 C) -4
D) -6 E) NOTA

4 Find: $\begin{bmatrix} -10 & -3 \\ -7 & -2 \end{bmatrix}^{-1} + \begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix}^T$

- A) $\begin{bmatrix} 0 & 7 \\ 13 & -2 \end{bmatrix}$ B) $\begin{bmatrix} 0 & -9 \\ -11 & 2 \end{bmatrix}$ C) $\begin{bmatrix} -32 & -84 \\ -22 & -58 \end{bmatrix}$
D) $\begin{bmatrix} 4 & 3 \\ -3 & 18 \end{bmatrix}$ E) NOTA

5 Let $A = \begin{bmatrix} -10 & 3 & 19 \\ 23 & -9 & -14 \end{bmatrix}$ $B = \begin{bmatrix} -8 & -6 & -2 \\ 14 & -3 & 1 \end{bmatrix}$
Let $C = 2A + B$ Let $D = A - 2B$

What is $C + D$

- A) $\begin{bmatrix} -10 & 3 & 19 \\ 23 & -9 & -14 \end{bmatrix}$ B) $\begin{bmatrix} -10 & -9 & 23 \\ -5 & -3 & -16 \end{bmatrix}$ C) $\begin{bmatrix} -26 & 3 & 19 \\ 23 & -9 & -14 \end{bmatrix}$
D) $\begin{bmatrix} -26 & -9 & -14 \\ -5 & -3 & -16 \end{bmatrix}$ E) NOTA

6 $\begin{bmatrix} 4a - 3 & 5b \\ 2a - 7c & d \end{bmatrix} = \begin{bmatrix} a + 9 & -6b \\ -3(4 - c) & 3(d - 2) \end{bmatrix}$ Find $a + b + c + d$

- A) 9 B) 10 C) 11
D) 12 E) NOTA

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Evaluate $\begin{vmatrix} 2 & 1 \\ 4 & 3 \end{vmatrix} + \begin{vmatrix} -3 & 7 \\ 2 & 6 \end{vmatrix} + \begin{vmatrix} 3 & 3 & 6 \\ 2 & -4 & 9 \\ 1 & 6 & 3 \end{vmatrix}$

- A) -94 B) -95 C) -96
 D) -123 E) NOTA

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Determine the value of $-6k$ if $\begin{vmatrix} 1 & -2 & 5 \\ 3 & k & 8 \\ -4 & 3 & -6 \end{vmatrix} = 8k + 3$.

- A) 21 B) 23 C) 46
 D) 106 E) NOTA

9 A system of 13 equations each containing the same 13 variables is to be evaluated using augmented matrices. How many elements does the augmented matrix contain?

- A) 144 B) 168 C) 169
 D) 182 E) NOTA

10 Which of the following sets are commutative with respect to multiplication?

- I. Even Numbers
 II. Matrices
 III. Complex Numbers
 IV. Nonnegative Numbers
- A) IV only B) II and III only C) I, II and IV
 D) I, III, and IV E) NOTA

11 If you were solving the following system of equations using Cramer's Rule, which of the following would represent the x value?

$$7x + 2y = 12$$

$$4x - 8y = 15$$

- A) $\frac{\begin{vmatrix} 2 & 12 \\ -8 & 15 \end{vmatrix}}{\begin{vmatrix} 7 & 2 \\ 4 & -8 \end{vmatrix}}$ B) $\frac{\begin{vmatrix} 12 & 2 \\ 15 & -8 \end{vmatrix}}{\begin{vmatrix} 7 & 12 \\ 4 & 15 \end{vmatrix}}$ C) $\frac{\begin{vmatrix} 12 & 2 \\ 15 & -8 \end{vmatrix}}{\begin{vmatrix} 7 & 2 \\ 4 & -8 \end{vmatrix}}$
 D) $\frac{\begin{vmatrix} 12 & 2 \\ 15 & -8 \end{vmatrix}}{\begin{vmatrix} 2 & 7 \\ -8 & 15 \end{vmatrix}}$ E) NOTA

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$$\text{Given } A = \begin{bmatrix} 2 & -1 \\ -4 & 2 \\ 0 & 3 \end{bmatrix} \quad B = \begin{bmatrix} -4 & -1 & 2 \\ -3 & 2 & -3 \end{bmatrix}$$

Find $60(BA)^{-1}$

A) $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$

B) $\begin{bmatrix} -2 & -8 \\ 14 & -4 \end{bmatrix}$

C) $\begin{bmatrix} -1 & -4 \\ 7 & -2 \end{bmatrix}$

D) $\begin{bmatrix} -3 & -16 \\ 21 & -6 \end{bmatrix}$

E) NOTA

13 Given the plane defined by $6x + 5y + 12z = 60$, what is the length of the plane's xz -trace in the first octant?

A) $5\sqrt{5}$

B) 12

C) 13

D) 15

E) NOTA

14 Transform the following augmented matrix to reduced row echelon form:

$$\left[\begin{array}{ccc|c} 1 & 1 & 2 & 12 \\ 1 & 1 & 1 & 9 \\ 3 & 2 & -1 & 11 \end{array} \right]$$

A) $\left[\begin{array}{ccc|c} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & 3 \end{array} \right]$

B) $\left[\begin{array}{ccc|c} 1 & 0 & 0 & 6 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & 2 \end{array} \right]$

C) $\left[\begin{array}{ccc|c} 1 & 0 & 0 & 2 \\ 1 & 0 & 0 & 4 \\ 1 & 0 & 0 & 3 \end{array} \right]$

D) $\left[\begin{array}{ccc|c} 1 & 0 & 0 & 6 \\ 1 & 0 & 0 & 4 \\ 1 & 0 & 0 & 2 \end{array} \right]$

E) NOTA

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$$\text{Find the inverse of } \begin{bmatrix} 7 & -3 & 4 \\ 4 & 2 & 2 \\ 3 & 8 & 1 \end{bmatrix}$$

A) 0

B) $\begin{bmatrix} \frac{7}{6} & \frac{29}{12} & \frac{1}{6} \\ \frac{1}{6} & \frac{5}{12} & \frac{1}{6} \\ \frac{13}{6} & \frac{47}{12} & \frac{1}{6} \end{bmatrix}$

C) $\begin{bmatrix} -\frac{7}{6} & \frac{29}{12} & -\frac{1}{6} \\ \frac{1}{6} & -\frac{5}{12} & \frac{1}{6} \\ \frac{13}{6} & -\frac{47}{12} & \frac{1}{6} \end{bmatrix}$

D) 12

E) NOTA

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Find the sum of the minor $M_{2,3}$ and the cofactor $A_{2,3}$, of $A = \begin{bmatrix} 2 & -1 & 2 \\ 4 & 3 & 3 \\ -5 & 2 & 0 \end{bmatrix}$

- A) -2
D) 2

- B) -1
E) NOTA

C) 1

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Find $a+b+c$ given the following $\begin{bmatrix} 1 & 0 & -1 \\ 2 & 1 & 0 \\ 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$

- A) -2
D) 1

- B) -1
E) NOTA

C) 0

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Find the area of the triangle with vertices $(-3,-1)$, $(4,2)$, and $(3,-3)$

- A) 4
D) 32

- B) 8
E) NOTA

C) 16

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Consider the system $\begin{cases} 3x-4y < 8 \\ 2x-5y > 0 \end{cases}$. Which of the following is true for an x or y coordinate that is a solution of the system?

- A)
- $x < 5$

- B)
- $y < 10$

C) $x < \frac{16}{7}$

- D)
- $y < \frac{16}{7}$

- E) NOTA

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Consider the system of equations $\begin{cases} 3x+4y=11 \\ 2x-7y=-6 \end{cases}$. If Cramer's Rule is used to solve this system, what is the value of the determinant for y (the determinant in the numerator when solving for y)?

- A) 53

- B) -40

C) -28

- D) 55

- E) NOTA

21 Which of the following is a homogeneous equation?

A) $7x^2 - 6x - 1 = 0$

B) $6x^2 - 5y^2 + 12x + 20y - 2 = 0$

C) $9x^2 + 2xy - 8y^2 + 6x + 4y - 11 = 0$

D) $6x^3 + 2x^2y - 7xy^2 + 13y^3 = 0$

- E) NOTA