Unit 5 - Week 3

Assignment 3

Due on 2020-10-07, 23:59 IST.

The due date for submitting the assignment has passed.

Assigned to: [student name]

1. For the matrix $b^T = [3, 2, -1, -2]$, consider the linear system $Mx = b^T$ where $M \in \mathbb{R}^{4 \times 4}$.

1.1. If $Mx$ has no solution then $M$ is 
- TRUE
- FALSE

Score: 1.00 point(s)

2. If $Mx = b^T$ has no solution then the homogeneous system $Mx = 0$ has only the trivial solution.

- TRUE
- FALSE

Score: 1.00 point(s)

3. Let $M = \begin{pmatrix} -1 & 2 & 1 & 0 \\ 0 & 1 & 0 & -1 \\ 1 & 0 & -1 & 0 \\ 0 & 1 & 0 & -1 \end{pmatrix}$ and $b = \begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$.

3.1. Let $Mx = b$ has no solution then the system $Mx = c$ has no solution.
- TRUE
- FALSE

Score: 1.00 point(s)

4. For $M = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, consider the five statements given below.

4.1. $Mx = b$ has a solution for every $b$.
- TRUE
- FALSE

Score: 1.00 point(s)

4.2. The system $Mx = b$ has a non-trivial solution.

- TRUE
- FALSE

Score: 1.00 point(s)

4.3. There exists no $b$ such that both the statements are TRUE simultaneously.

- TRUE
- FALSE

Score: 1.00 point(s)

4.4. There does not exist $M$ for which both the statements can hold TRUE simultaneously.

- TRUE
- FALSE

Score: 1.00 point(s)

5. Let $M = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{pmatrix}$ and $N = \begin{pmatrix} 1 & 2 \\ 2 & 3 \\ 3 & 4 \end{pmatrix}$.

5.1.1. denote $\det(M)$ and $\det(N) = |M| - |N|$

Score: 1.00 point(s)

5.2. denote $\det(M)$ and $\det(N) = |M| - |N|$

Score: 1.00 point(s)

5.3. denote $\det(M)$ and $\det(N) = |M| - |N|$

Score: 1.00 point(s)

6. For $M \in \mathbb{R}^{3 \times 3}$, consider the five statements given below.

6.1. The system $Mx = b$ has a solution for every $b$.
- TRUE
- FALSE

Score: 1.00 point(s)

6.2. The system $Mx = b$ has a non-trivial solution.

- TRUE
- FALSE

Score: 1.00 point(s)

6.3. There exists no $b$ such that both the statements are TRUE simultaneously.

- TRUE
- FALSE

Score: 1.00 point(s)

6.4. There does not exist $M$ for which both the statements can hold TRUE simultaneously.

- TRUE
- FALSE

Score: 1.00 point(s)

6.5. denote $\det(M)$ and $\det(N) = |M| - |N|$

Score: 1.00 point(s)

7. Let $M = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{pmatrix}$ and $N = \begin{pmatrix} 1 & 2 \\ 2 & 3 \\ 3 & 4 \end{pmatrix}$.

7.1. denote $\det(M)$ and $\det(N) = |M| - |N|$

Score: 1.00 point(s)

7.2. denote $\det(M)$ and $\det(N) = |M| - |N|$

Score: 1.00 point(s)

7.3. denote $\det(M)$ and $\det(N) = |M| - |N|$

Score: 1.00 point(s)

8. Let $a, b, c$ and $d$ be some numbers. Denote $N = \begin{pmatrix} a & b & c & d \end{pmatrix}$.

8.1. denote $\det(M)$ and $\det(N) = |M| - |N|$

Score: 1.00 point(s)

8.2. denote $\det(M)$ and $\det(N) = |M| - |N|$

Score: 1.00 point(s)

8.3. denote $\det(M)$ and $\det(N) = |M| - |N|$

Score: 1.00 point(s)

9. The value of $a$ to make the system $a^{T}x = [3, 2]$, $(x, y) = 0$, in the statement $a \in [1, 2]$, $x, y$ has a non-trivial solution. 

Scores: 1.00 point(s)

10. Let $M = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ be an orthogonal matrix $M^T M = M M^T = I_2$. Then, which is among the following is TRUE? 

10.1. denote $\det(M)$ and $\det(N) = |M| - |N|$

Score: 1.00 point(s)

10.2. denote $\det(M)$ and $\det(N) = |M| - |N|$

Score: 1.00 point(s)

10.3. denote $\det(M)$ and $\det(N) = |M| - |N|$

Score: 1.00 point(s)

10.4. denote $\det(M)$ and $\det(N) = |M| - |N|$

Score: 1.00 point(s)

10.5. denote $\det(M)$ and $\det(N) = |M| - |N|$

Score: 1.00 point(s)