MATHEMATICS

Tuesday March 7 2017

Second exercise class

1) Determine the parametric equation and the Cartesian equation of the plane π passing through $A(1,1,1)$, $B(1,0,-1)$, $C(0,-1,1)$.
Determine the parametric equation and the Cartesian equation of the line r passing through $D(2,1,0)$ and orthogonal to π.
Determine the parametric equation and the Cartesian equation of the plane β parallel to π and passing through $E(1,-1,3)$.

2) Given the matrices
$$A = \begin{pmatrix} 1 & 0 & 2 & 0 \\ 0 & -3 & -1 & 0 \\ -2 & -1 & 1 & 3 \\ 0 & 0 & 0 & -1 \end{pmatrix} \quad \text{and} \quad B = \begin{pmatrix} -1 & 1 & 0 & 0 \\ 0 & -3 & -1 & 2 \\ -2 & 0 & 1 & 3 \\ 0 & 2 & 0 & -1 \end{pmatrix}$$
Calculate:
- $A + B$
- $3A$
- $trace(B)$
- A^T
- $A \cdot B$
- $B \cdot A$

3) Determine, if it is possible, the product between the indicated matrices.
- $A = \begin{pmatrix} 0 & 1 \\ 1 & -1 \end{pmatrix}$ and $B = \begin{pmatrix} 3 & 1 \\ 0 & -2 \end{pmatrix}$.
- $A = \begin{pmatrix} 0 & 1 & -1 \\ 1 & 0 & -2 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & 0 \\ 0 & -2 \\ 1 & -1 \end{pmatrix}$.
- $A = \begin{pmatrix} 0 & 1 \\ 1 & -1 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & -1 & 0 \\ 0 & -2 & 1 \end{pmatrix}$.
- $A = \begin{pmatrix} -1 & 1 & 0 \\ 1 & 0 & -3 \\ 0 & 3 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 0 & -1 \\ -1 & 2 & 0 \\ 0 & 1 & -2 \end{pmatrix}$.
- $A = \begin{pmatrix} 1 & 1 & 0 \\ 1 & 0 & -2 \\ -1 & 2 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} 3 & -2 \\ 1 & 0 \\ 0 & -1 \end{pmatrix}$.
- $A = \begin{pmatrix} 1 & -1 \\ -1 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & 2 \\ -2 & 0 \\ 1 & -1 \end{pmatrix}$
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4) Given the matrices $A = \begin{pmatrix} 1 & -1 \\ 2 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$, find a matrix $X = \begin{pmatrix} x \\ y \end{pmatrix}$ such that $A \cdot X = B$.

5) Given the matrix
$$A = \begin{pmatrix} t & -t \\ 1 & 1-t \end{pmatrix}$$
for which value of *t* the determinant of A is 0?

6) Given the matrix

$$A = \begin{pmatrix} t & 6t & 2 \\ t^2+9 & 0 & 6-t \\ 2 & t^2 & 1-t \end{pmatrix}$$

for which value of *t* the matrix *A* is symmetric?

7) Calculate the determinant of the following matrices.

- $A = \begin{pmatrix} 2 & 1 \\ 1 & -1 \end{pmatrix}$
- $B = \begin{pmatrix} 5 & 3 \\ 0 & 2 \end{pmatrix}$
- $C = \begin{pmatrix} 1 & 1 & -1 \\ -1 & 2 & -3 \\ -1 & 3 & 4 \end{pmatrix}$
- $D = \begin{pmatrix} -2 & 1 & -1 \\ 3 & 2 & -1 \\ 1 & 3 & -2 \end{pmatrix}$
- $E = \begin{pmatrix} -1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$
- $F = \begin{pmatrix} 5 & 3 & 1 \\ 0 & -1 & -2 \\ 0 & 0 & 2 \end{pmatrix}$
- $G = \begin{pmatrix} 3 & 0 & 0 \\ 2 & 1 & 0 \\ -1 & 5 & 4 \end{pmatrix}$

8) Calculate the inverse of the following matrices.

$A = \begin{pmatrix} 1 & 3 \\ -1 & 2 \end{pmatrix}$, $B = \begin{pmatrix} 2 & -1 & 3 \\ 0 & 1 & 2 \\ 1 & -2 & -1 \end{pmatrix}$.

9) Determine for which values of α and β the following matrices are invertible.

$A = \begin{pmatrix} \alpha & 1 \\ -1 & -\alpha \end{pmatrix}$, $B = \begin{pmatrix} \beta & 2 & 0 \\ 0 & \beta & 2 \\ \beta & 0 & \beta \end{pmatrix}$.

10) Decide if the following vectors in $\mathbb{R}^4$ are linearly independent.
$\overrightarrow{v_1} = (1,-1,0,2)$, $\overrightarrow{v_2} = (0,1,-2,1)$, $\overrightarrow{v_3} = (2,0,-1,0)$.

11) Decide if the following vectors in $\mathbb{R}^4$ are linearly independent.
$\overrightarrow{v_1} = (3,1,-1,2)$, $\overrightarrow{v_2} = (0,-1,2,1)$, $\overrightarrow{v_3} = (6,3,-4,3)$.

12) Decide if the following set of point in $\mathbb{R}^2$ is independent.
$A(1,1)$, $B = (2,1)$, $C(1,-3)$.

13) Decide if the following set of point in $\mathbb{R}^3$ is independent.
$A(1,-1,1)$, $B = (0,-2,1)$, $C(3,0,-1)$, $D(2,0,1)$.