Name ______________________________

MA 265 Quiz 2

For a given matrix A, MATLAB shows that

$$\text{rref}(A) = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{pmatrix}.$$

1. Let B be a 3×1 matrix. Determine if each of the following statements is true.

(a) For every B, the system $AX = B$ has infinitely many solutions. True $\boxed{\text{False}}$

(b) For some B, the system has a unique solution. True $\boxed{\text{False}}$

(c) For some B, the system $AX = B$ has a nontrivial solution. $\boxed{\text{True}}$ False

(d) The system $AX = 0$ has infinitely many solutions. $\boxed{\text{True}}$ False

(e) The system $AX = 0$ has no solution. True $\boxed{\text{False}}$

2. Find the solution of system $AX = 0$.

$$\boxed{X = \begin{pmatrix} 0 \\ -1 \\ 1 \end{pmatrix} r, \ r \in \mathbf{R}}$$

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MA 265 Quiz 4

Consider the set V consists of all pairs (x, y) of real numbers. Consider the following operations:

$(x, y) \oplus (w, z) = (x + w, y + z)$ for all pairs (x, y) and (w, z).

$c \odot (x, y) = (c^2 x, c^2 y)$ for all pairs (x, y) and $c \in \mathbf{R}$.

(a) Is V with the two operations a vector space? Yes $\boxed{\text{No}}$

Provide a brief explanation for your choice.

(b) Determine which of the following statements are true.

A. $(x, y) \oplus (w, z) = (w, z) \oplus (x, y)$. $\boxed{\text{True}}$ False

B. $c \odot ((x, y) \oplus (w, z)) = c \odot (x, y) \oplus c \odot (w, z)$. $\boxed{\text{True}}$ False

C. $(c + d) \odot (x, y) = c \odot (x, y) \oplus d \odot (x, y)$. True $\boxed{\text{False}}$

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MA 265 Quiz 6

Consider the set of vectors $S = \{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$ of $\mathbf{R}^3$, where

$$\mathbf{v}_1 = \begin{pmatrix} 2 \\ 3 \\ -3 \end{pmatrix}, \ \mathbf{v}_2 = \begin{pmatrix} 1 \\ 1 \\ -2 \end{pmatrix}, \ \mathbf{v}_3 = \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}, \ \mathbf{v}_4 = \begin{pmatrix} 1 \\ 2 \\ 0 \end{pmatrix}$$

(a) The vector $\mathbf{v}_4$ belongs to span S. True $\boxed{\text{False}}$

(b) Which of the following statements are TRUE?

(i) S is linearly dependent.

(ii) S spans $\mathbf{R}^3$.

(iii) S forms a basis for $\mathbf{R}^3$.

$\boxed{\text{A. (i) only}}$

B. (ii) only

C. (iii) only

D. (i), (ii) only

E. (i), (iii) only

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MA 265 Quiz 9

Let W be the subspace of $\mathbf{R}^3$ with basis $\{u_1, u_2\}$, where $u_1 = \begin{bmatrix} 0 \\ 3 \\ 0 \end{bmatrix}$, $u_2 = \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$. Let $v = \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix}$. What is the projection $\text{proj}_W v$ of v onto W?

$$\boxed{\text{proj}_W v = \begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix}}$$

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MA 265 Quiz 10

Consider the system of differential equations $\mathbf{x}' = A\mathbf{x}$, where $A = \begin{bmatrix} 1 & -1 & 0 \\ 0 & -1 & 0 \\ 1 & -1 & 2 \end{bmatrix}$.

(a) Given that two of the eigenvalues of A are 1 and -1, and the associated eigenvectors are $\begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$ and $\begin{bmatrix} 3 \\ 6 \\ 1 \end{bmatrix}$, respectively. Find the general solution.

$$\boxed{\mathbf{x} = c_1 \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix} e^t + c_2 \begin{bmatrix} 3 \\ 6 \\ 1 \end{bmatrix} e^{-t} + c_3 \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} e^{2t}}$$

(b) Find the particular solution $\mathbf{x}_p$ corresponding to the initial condition $\mathbf{x}(0) = \begin{bmatrix} 2 \\ 6 \\ 0 \end{bmatrix}$.

$$\boxed{\mathbf{x}_p = \begin{bmatrix} -e^t + 3e^{-t} \\ 6e^{-t} \\ e^t + e^{-t} - 2e^{2t} \end{bmatrix}}$$