

Review for TEST 3

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Name _____

Linear Algebra MTH 3331

S.S.N. _____

1a. If $\vec{u} = (1, 2, -3)$, $\vec{v} = (3, 0, 5)$, and $\vec{w} = (0, 5, -2)$, find $5\vec{u} - 2\vec{w}$.

1b. Solve for \vec{w} in the equation $5\vec{u} - 2\vec{w} = 3\vec{v}$.

2. Determine whether the set $\{(x, x) : x \text{ is a real number}\}$, with the standard operations in \mathcal{R}^2 , is a vector space.

3. Which of the following subsets is a subspace of \mathcal{R}^3 with the standard operations?

$$W = \{(s, s - t, t) \mid s \text{ and } t \text{ are real numbers}\}.$$

4. Describe the subspace of \mathcal{R}^3 spanned by the vectors in

$$S = \{(-1, 1, 4), (1, -1, 4), (1, 1, 4)\}.$$

5. Determine whether the set S is linearly independent or dependent.

$$S = \{(1, 1, 1), (0, 1, -3), (1, 2, -2)\}$$

6. Determine whether the following set is a basis for \mathcal{R}^3 ?

$$S = \{(1, 5, 3), (0, 1, 2), (0, 0, 6)\}.$$

7. Find the rank of the matrix

$$\begin{bmatrix} 1 & 0 & 0 & 1 & -1 \\ -1 & 0 & 0 & -1 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

8. Find the dimension of the solution space of the following homogeneous system of equations.

$$x_1 - 2x_2 + x_3 - x_4 = 0$$

$$x_2 + x_3 + x_4 = 0$$

$$x_1 - x_2 + 2x_3 = 0$$

$$2x_2 + 2x_3 + 2x_4 = 0$$

9. Write the vector $\vec{w} = (1, 2, -5)$ as a linear combination of the vectors $\vec{v}_1 = (1, 1, 1)$, $\vec{v}_2 = (0, 2, 1)$ and $\vec{v}_3 = (1, 0, 0)$.

10. Find the transition matrix from the basis $B = \{(0, 1, 1), (1, 0, 1), (1, 1, 0)\}$ to the basis $B' = \{(1, 0, 0), (0, 0, 1), (0, -1, 0)\}$.