Math 3323, Test II

Name _____

1. What is the volume of a parallelopiped with edges

$$u = \begin{bmatrix} 2 \\ 2 \\ 0 \end{bmatrix}, v = \begin{bmatrix} 1 \\ 4 \\ 0 \end{bmatrix}, w = \begin{bmatrix} 1 \\ 2 \\ 4 \end{bmatrix}$$

answer: 24

2. If

$$A = \begin{bmatrix} 1 & 1 & 3 & 1 & 0 \\ 2 & 1 & 5 & 4 & 0 \\ 1 & 2 & 4 & -1 & 0 \end{bmatrix},$$

a. Find a basis for the subspace spanned by the rows of A.

answer: $< 1, 0, 2, 3, 0 >, < 0, 1, 1, -2, 0 >$ is one basis.

b. Find a basis for the null space of A.

answer: $< -2, -1, 1, 0, 0 >, < -3, 2, 0, 1, 0 >, < 0, 0, 0, 0, 1 >$ is one basis.

c. What is the rank and what is the nullity of A?

answer: rank=2, nullity=3

3. Do the given restrictions on vectors

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

in R^2 define subsets which are subspaces of R^2?

a. $x_1 = 2x_2$ (yes)

b. $3x_1 - x_2 = 0$ (yes)

c. $x_1 x_2 = 0$ (no)

d. $x_1 = 0$ and $x_2 = 0$ (yes)

4. Write the equation for the plane through (1,1,-2) perpendicular to the vector (3,2,1).

answer: $3(x - 1) + 2(y - 1) + (z + 2) = 0$

5. True or False (remember that a statement is false unless it is *always* true):

a. The dot product is only defined for vectors in R^3. (false)

b. The plane $x + y - z = 0$ is a subspace of R^3. (true)

c. A set of 4 vectors in a 7-dimensional subspace may be a spanning set for the subspace. (false)

d. A set of 4 vectors in a 7-dimensional subspace may be linearly dependent. (true)

e. A basis for a 7-dimensional subspace may contain 8 vectors. (false)

f. The null space of B is a subset of the null space of AB. (true)

g. The intersection of two subspaces is a subspace. (true)

h. The null space of a nonsingular n x n matrix is R^n. (false)

i. The set of solutions to $Ax = b$ is a subspace. (false)

j. Every subspace must contain the zero vector. (true)