Math 3323, Test II

Name _____

1. What is the area of a triangle with vertices (2,2,0),(2,4,2) and (0,0,4)?

   answer: $\sqrt{44}$

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 range of A.

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

   b. What is the dimension of the null space?

   answer: 3

3. Do the given restrictions on vectors
$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$
   in R^3 define subsets which are subspaces of R^3?

a. $x_1 = 2x_3$ (yes)

b. $x_1 - x_2 + 2x_3 = 0$ (yes)

c. $x_1 = 0$ or $x_2 = 0$ or $x_3 = 0$ (no)

d. $x_3 = x_2^2 - x_1$ (no)

4. Find the point where the line $x = 8+4t, y = 3+4t, z = 4-8t$ intersects the plane $x + 2y + z = 2$.

   answer: $(-8, -13, 36)$

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

   a. The cross product is only defined for vectors in R^3. (true)

   b. The plane $x_1 - x_2 + 2x_3 = 2$ is a subspace of R^3. (false)

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

   d. A set of 9 vectors in a 7-dimensional subspace may be linearly independent. (false)

   e. Any basis for a 7-dimensional subspace must have exactly 7 vectors. (true)

   f. The range of AB is a subset of the range of A. (true)

   g. The union of two subspaces is a subspace. (false)

   h. The range of any nonsingular n x n matrix is R^n. (true)

   i. $u \times v = \|u\| \ \|v\| \ sin(\theta)$, where θ is the angle between u and v. (false)

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