

1. Give an example of 2 x 2 matrices A and B and a 2 x 1 vector v such that $Av = Bv$ but A and B are NOT equal.

$$A = \begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix} \quad B = \begin{bmatrix} 3 & 2 \\ 10 & 0 \end{bmatrix} \quad v = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

2. (From Trigonometry:) Complete the following

a) $\cos(x + y) = \cos(x)\cos(y) - \sin(x)\sin(y)$

b) $\sin(x + y) = \sin(x)\cos(y) + \cos(x)\sin(y)$

3. What do rotation matrices DO?

A rotation matrix is used to multiply with a vector in order to rotate that vector by an angle theta pivoting about the origin. When theta is less than 0 the vector rotates counterclockwise and clockwise when theta is greater than zero.

4.

a) Find the rotation matrix A for a rotation of 45 degrees.

$$A = \begin{bmatrix} \cos 45 & -\sin 45 \\ \sin 45 & \cos 45 \end{bmatrix}$$

$$\begin{bmatrix} \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} \\ \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \end{bmatrix}$$

b) For the vector $v = [1 \ 1]^T$, find the vector w obtained by rotating vector v 45 degrees.

$$w = [0 \ \sqrt{2}]^T$$

5.

(a) Give an example of a linear equation with the variables x , y , and z .

$$3x+4y+5z=10$$

(b) Give an example of an equation that is not a linear equation with the variables x , y , and z .

$$3x+4y+5z^2=10$$

$$xyz = 23$$

$$x^2 + y^2 = z^2$$

6. How many possibilities are there for the solution set of a system of linear equations?

Every system of linear equations has no solution, exactly one solution, or infinitely many solutions.

7. If there are more variables than equations in a system of linear equations, how many solutions would you expect to get (not that this will ALWAYS happen; just what would you expect)?

I would expect there to be infinitely many solutions because the less equations give you the better chance to find numbers that will work.

8. If there are more equations than variables in a system of linear equations, how many solutions would you expect to get (not that this will ALWAYS happen; just what would you expect)?

No solutions because having three equations for two variables leaves you with more equations than necessary to solve the set of equations.

I would expect one solution or no solutions because when you add more equations it makes it harder to find numbers that will satisfy all the equations.