1. Are the vectors $\begin{bmatrix} -2 \\ 4 \end{bmatrix}$, $\begin{bmatrix} 7 \\ -2 \end{bmatrix}$ and $\begin{bmatrix} 3 \\ -6 \end{bmatrix}$ linearly independent?

   (a) Yes

   (b) No

   Answer: (b)

2. Does the set, $S = \{(1,1), (1,2)\}$ spans $\mathbb{R}^2$?

   (a) Yes

   (b) No

   Answer: (a)

3. Consider the following system of linear equations of the form $Ax = b$:

$$2x - 3y + 6z = 14$$

$$x + y - 2z = -3$$

   Which among the following are correct?

   (a) $\begin{bmatrix} 1 \\ -4 \\ 0 \end{bmatrix}$ is a solution to $Ax = b$

   (b) $\begin{bmatrix} 0 \\ 2 \\ 1 \end{bmatrix}$ is a solution to $Ax = b$

   (c) $\begin{bmatrix} 1 \\ -4 \\ 0 \end{bmatrix}$ is a solution to $Ax = 0$

   (d) $\begin{bmatrix} 0 \\ 2 \\ 1 \end{bmatrix}$ is a solution to $Ax = 0$

   Answer: (a, d)

4. Consider the following systerm of linear equation:

$$x + y + z = -2$$

$$x + 2y - z = 1$$

$$2x + ay + bz = 2$$

(i) Find the conditions on a and b for which the above system has no solution.
   (a) $2a + b - 6 = 0$
   (b) $a \neq 4, 2a + b - 6 = 0$
   (c) $a = 4, b = -2$
   (d) $2a + b - 6 \neq 0$

   Answer: (b)

(ii) Find the conditions on a and b for which the above system has a unique solution.
   (a) $2a + b - 6 = 0$
   (b) $a \neq 4, 2a + b - 6 = 0$
   (c) $a = 4, b = -2$
   (d) $2a + b - 6 \neq 0$

   Answer: (d)

(iii) Find the conditions on a and b for which the above system has infite number of solutions.
   (a) $2a + b - 6 = 0$
   (b) $a \neq 4, 2a + b - 6 = 0$
   (c) $a = 4, b = -2$
   (d) $2a + b - 6 \neq 0$

   Answer: (c)

5. In solving the system $Ax = b$ in the variables x_1, x_2, x_3 and x_4, Gaussian elimination on the Augmented matrix $[A \mid b]$ led to the following row echelon form

$$\begin{pmatrix} 1 & 0 & 0 & 3 & 2 \\ 0 & 1 & 1 & 2 & 3 \\ 0 & 0 & 0 & 1 & 1/3 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

(i) Identify the number of free variable from the above rwo echelon matrix.
   (a) 0
   (b) 1
   (c) 2

(d) 3

(ii) Which among the following is correct for the above system $Ax = b$?

    (a) It has infinite number of solutions.

    (b) It has a unique solution.

    (c) It has no solution.

6. For what values of a are matrix $A = \begin{bmatrix} a & 1 \\ -2 & a+3 \end{bmatrix}$ not invertible?

    (a) $a = 1$

    (b) $a = -2$

    (c) $a = -1$

    (d) $a = 2$

7. Which among the following is true for the determinant of a matrix?

    (a) The determinant of a diagonal matrix is the product of its diagonal entries.

    (b) If one row of a matrix is a scalar multiple of another, the determinant is 1.

    (c) If one row of a matrix is a scalar multiple of another, the determinant is 0.

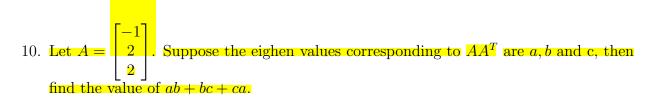   (d) The determinant of a permutation matrix can only be 1.

8. Which among the following are the eigenvalues of matrix $A = \begin{pmatrix} 5 & 8 & 16 \\ 4 & 1 & 8 \\ -4 & -4 & -11 \end{pmatrix}$?

    (a) $1, 3, -3$

    (b) $1, 3, 3$

    (c) $-1, 3, 3$

    (d) $1, -3, -3$

9. Find the nullity of $A = \begin{bmatrix} 1 & -3 & -2 & 4 \\ 1 & -3 & 1 & 1 \\ 0 & 0 & 1 & -1 \end{bmatrix}$.

10. Let $A = \begin{bmatrix} -1 \\ 2 \\ 2 \end{bmatrix}$. Suppose the eighen values corresponding to AA^T are a, b and c, then find the value of $ab + bc + ca$.

   (a) 9

   (b) 0

   (c) 81

   (d) 18

Answer: (b)