

Non-technology portion

1) Find a formula for $[\vec{x}]_S$, given the information below.

(+2/-3 points)

$$B = \left\{ \begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} \right\}, [\vec{x}]_B = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$$

2) Find a formula for \vec{v} , given the information below.

(+2/-3 points)

$$G = \left\{ \begin{bmatrix} 3 \\ 2 \end{bmatrix}, \begin{bmatrix} 1 \\ 4 \end{bmatrix} \right\}, [\vec{x}]_G = \left\{ \begin{bmatrix} 5 \\ 2 \end{bmatrix} \right\}$$

3) Find the determinant of the matrix below.

(+2/-5 points)

$$\begin{bmatrix} 1 & -5 \\ 0 & -4 \end{bmatrix}$$

4) Find the determinant of matrix A , given the information below.

(+4/-1 points)

$$A = \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix} B, \quad |B| = 2$$

5) Given that $T(\vec{x}) = A\vec{x}$ and the matrix A below. Is T one-to-one? Justify your answer.
(+3/-2 points)

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

6) Given that $T(\vec{x}) = A\vec{x}$ and the matrix A below. Is T onto? Justify your answer.
(+4/-2 points)

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

7) Find the rank of the matrix below.

(+3/-5 points)

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

8) An 19×16 matrix has a null space of dimension 3. What is the rank of A ?

(+3/-3 points)

9) Find the determinant of the matrix below.

(+4/-2 points)

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 4 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 0 & 0 & 3 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

10) Given that $T(\vec{x}) = A\vec{x}$ and the matrix $A = \begin{bmatrix} 2 & 0 & 1 \\ 3 & 0 & 2 \end{bmatrix}$ below, find $T\left(\begin{bmatrix} 1 \\ 2 \\ 0 \end{bmatrix}\right)$.

(+1/-5 points)

11) Prove that the function $f(x) = 3x + 2$ is one-to-one.
(+4/-1 points)

12) Let A be an 7×7 matrix. You know that $A\vec{x} = \vec{0}$ has only one solution. What else can you say?
(Maximum +8/-8 points) (You may list as many statements as you like, each insightful statement is worth +2 or -2 points.)

Technology portion

13) Find the inverse of the matrix below.

(+5/-5 points)

$$\begin{bmatrix} 1 & 0 & 8 & 4 \\ 0 & 2 & 0 & 0 \\ 1 & 5 & 3 & 4 \\ 0 & 7 & 0 & 1 \end{bmatrix}$$

14) Find $[\vec{x}]_{B_2}$, given the information below.

(+5/-5 points)

$$B_1 = \left\{ \begin{bmatrix} 2 \\ 6 \\ 4 \end{bmatrix}, \begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 2 \\ 1 \\ 7 \end{bmatrix} \right\}, B_2 = \left\{ \begin{bmatrix} 5 \\ 3 \\ 4 \end{bmatrix}, \begin{bmatrix} 1 \\ 5 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 2 \end{bmatrix} \right\}, [\vec{x}]_{B_1} = \begin{bmatrix} 1 \\ 2 \\ 5 \end{bmatrix}$$