Date

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QUESTION NO 1:

ANSWER:

For R^3, $V_1 \times V_2 \times V_3 = \begin{pmatrix} 1 \\ 6 \\ 0 \end{pmatrix} \cdot \begin{pmatrix} 6 \\ 0 \\ 1 \end{pmatrix} \cdot \begin{pmatrix} 0 \\ 1 \\ 5 \end{pmatrix}$

$= ID_1(6 \cdot 0 \cdot 1) + ID_2(6 \cdot 0 \cdot 1) + (6 \cdot 5 \cdot 1)$

The desired coordinates of R_1 is

$(1 \cdot 6 \cdot 6 \cdot 6 \cdot 0 \cdot 6)$

Similarly $(1 \cdot 0 \cdot 6 \cdot 0 \cdot 0 \cdot 0)$

and

$(1 \cdot 1 \cdot 6 \cdot 1 \cdot 0 \cdot 1)$

So $A = \begin{bmatrix} 1 \cdot 6 & 1 \cdot 0 & 1 \cdot 1 \\ 6 \cdot 6 & 6 \cdot 0 & 6 \cdot 1 \\ 0 \cdot 6 & 0 \cdot 0 & 0 \cdot 1 \end{bmatrix}$

So you can see each column of above R_3 vector are linearly independent to each other

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QUESTION NO 2:

ANSWERS

In matrix form, we can write it as:

$$450 \times 1 + 250 \times 2 = 1000$$
$$400 \times 1 + 350 \times 2 = 500$$

$$\underbrace{\begin{bmatrix} 450 & 250 \\ 400 & 350 \end{bmatrix}}_{A} \underbrace{\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}}_{X} = \underbrace{\begin{bmatrix} 1000 \\ 500 \end{bmatrix}}_{B}$$

$$\Rightarrow X = A^{-1} B$$

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 450 & 250 \\ 400 & 350 \end{bmatrix}^{-1} \begin{bmatrix} 1000 \\ 500 \end{bmatrix}$$

$$\text{adj}(A) = \begin{bmatrix} 350 & -250 \\ -400 & 450 \end{bmatrix} \quad |A| = \begin{vmatrix} 450 & 250 \\ 400 & 350 \end{vmatrix}$$

$$|A| = (450)\cdot(350) - (250)(400) =$$
$$157,500 - 100,000 = 57,500.$$

$$\Rightarrow \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \frac{1}{57,500} \begin{bmatrix} 350 & -250 \\ -400 & 450 \end{bmatrix} \begin{bmatrix} 1000 \\ 500 \end{bmatrix}$$

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$$= \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \frac{1}{57500} \begin{bmatrix} 350,000 & -125,000 \\ -400,000 & +225,000 \end{bmatrix}$$

$$= \begin{bmatrix} 225000 \\ -175,000 \end{bmatrix}$$

$= x_1 = 225,000, \quad x_2 = 175,000$

Total cost $= x_1 + x_2 = 400,000$.

Answer.

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QUESTION: No 3:

ANSWER:

A vector state is a collection of objects called vectors, which may be added together and multiplied (scaled) by numbers- scalars are often taken to be real numbers, but there are also vector spaces with scalar multiplication by complex numbers, rational numbers or generally any field.

a) Soln: $K\begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} Ka & b \\ Kc & d \end{pmatrix}$

for $K \in R$.

According to the definition of vector space if any scalar multiply by vector space than it will become vector space. So in this case $K\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is not vector space

$$\begin{pmatrix} Ka & b \\ Kc & d \end{pmatrix} = \begin{pmatrix} Ka & Kb \\ Kc & Kd \end{pmatrix}$$

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b)

Sol^n:

Let $P(x) = a_1x^3 + a_2x^2 + x + C$

which is defined and correct according to definition of vector space.

QUESTION NO 4:

ANSWER:

$$\text{Let } \cancel{\alpha} \neq M = \begin{pmatrix} a & b \\ c & d \end{pmatrix} - ad - bc$$

a) $|M| = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc.$

If we take inverse of M

i.e $M^{-1} = \dfrac{\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}}{ad-bc}$

i-e: $M \cdot M^{-1} = I.$

b) All 2×2 identity matrices are:

$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}, \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}, \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$$

and $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}.$

c) All 2×2 matrices for zero dot. are

$$\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}, \begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix}, \begin{pmatrix} 0 & 0 \\ 1 & 0 \end{pmatrix}, \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix}$$

d:

Det A: $\begin{vmatrix} 1 & 1 & 1 \\ 6 & 0 & 6 \\ 1 & 1 & 5 \end{vmatrix}$

$= 1\cdot 0\cdot 5 - 1\cdot 6\cdot 1 + 1\cdot 6\cdot 5 - 1\cdot 6\cdot 1 + 1\cdot 6\cdot 1\cdot$
$1\cdot 6\cdot 5$

$= 0 - 6 + 30 - 6 + 6 + 30$

$= -6 + 30 - 6 + 6 + 30$

$= -6 - 6 + 6 + 30 + 30$

$= -12 + 66$

$= 54$ Answer-