

37233 Linear Algebra

Assignment 4 - Solutions

Q1 There is no such h that makes this matrix invertible

Q2

`RowReduce[{{1, -2, 1, 1, 4},
 {2, 1, -3, -1, 6}, {1, -7, -6, 2, 6}}] // MatrixForm`

$$\begin{pmatrix} 1 & 0 & 0 & -\frac{1}{30} & \frac{16}{5} \\ 0 & 1 & 0 & -\frac{13}{30} & -\frac{2}{5} \\ 0 & 0 & 1 & \frac{1}{6} & 0 \end{pmatrix}$$

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 16/5 \\ -2/5 \\ 0 \\ 0 \end{pmatrix} + t \begin{pmatrix} 1/30 \\ 13/30 \\ -1/6 \\ 1 \end{pmatrix}$$

Q3

`RowReduce[{{1, 1, 3, 1, 0}, {2, 3, 1, 1, 0}, {1, 0, 8, 2, 0}}] //
MatrixForm`

$$\begin{pmatrix} 1 & 0 & 8 & 2 & 0 \\ 0 & 1 & -5 & -1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = s \begin{pmatrix} -8 \\ 5 \\ 1 \\ 0 \end{pmatrix} + t \begin{pmatrix} -2 \\ 1 \\ 0 \\ 1 \end{pmatrix}$$

Q4

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{ {4, -6, b1}, {8, 12, b2}, {6, -9, b3} } // MatrixForm
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$$\begin{pmatrix} 4 & -6 & b_1 \\ 8 & 12 & b_2 \\ 6 & -9 & b_3 \end{pmatrix}$$

$$\begin{pmatrix} 2 & -3 & b_1/2 \\ 0 & 6 & b_2/4 - b_1/2 \\ 0 & 0 & b_3/3 - b_1/2 \end{pmatrix}$$

So the system will be consistent if $3b_1=2b_3$

This is an equation of a plane. Note the columns of the matrix belong to this plane.

Q5

$A = \{ \{1/2, 1/2, 1/2, 1/2\}, \{1/2, 1/2, -1/2, -1/2\},$
 $\{1/2, -1/2, -1/2, 1/2\}, \{1/2, -1/2, 1/2, -1/2\} \}$

$\{ \{ \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2} \}, \{ \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2} \}, \{ \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2} \}, \{ \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2} \} \}$

$$\begin{pmatrix} \frac{1}{2} & \frac{1}{2} & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} & -\frac{1}{2} & -\frac{1}{2} \\ \frac{1}{2} & -\frac{1}{2} & -\frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & -\frac{1}{2} & \frac{1}{2} & -\frac{1}{2} \end{pmatrix}$$



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Det[A]
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