Math104
Quiz#1

Q1) Given the following matrices (60 points)

$$C=\begin{pmatrix}1 & 2\\ 3 & 4\end{pmatrix} \qquad D=\begin{pmatrix}2 & 0 & -1\\ 1 & -3 & -2\end{pmatrix} \qquad E=\begin{pmatrix}1 & -2\\ 2 & 1\\ 3 & 0\end{pmatrix}$$

If possible, find

a) $E-C=(E)_{3\times 2}-(C)_{2\times 2}$ is not defined. Because the size of these matrices are not same.

b) $DE=\begin{pmatrix}2 & 0 & -1\\ 1 & -3 & -2\end{pmatrix}\begin{pmatrix}1 & -2\\ 2 & 1\\ 3 & 0\end{pmatrix}=\begin{pmatrix}-1 & -4\\ -11 & -5\end{pmatrix}$

c) $-3I+C=-3\begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix}+\begin{pmatrix}1 & 2\\ 3 & 4\end{pmatrix}=\begin{pmatrix}-2 & 2\\ 3 & 1\end{pmatrix}$

d) $(E^t)_{2\times 3}(D)_{2\times 3}$ is not defined. Because the number of columns of matrix E^t is not equal the number of rows of matrix D.

e) |D| is not defined, because it is not square matrix.

f) $d_{23}=$ -2

g) size (dimension) of E is …… 3×2 ……

Q2) Find x if (20 points)

$\begin{pmatrix}6 & 2\\ x & 7\\ 3y & 2z\end{pmatrix}=2\begin{pmatrix}3 & 1\\ 3 & 7/2\\ 1 & 7/2\end{pmatrix}$ $\begin{pmatrix}6 & 2\\ x & 7\\ 3y & 2z\end{pmatrix}=\begin{pmatrix}6 & 2\\ 6 & 7\\ 2 & 7\end{pmatrix}$, So $x=6$

Q3) Solve the following system by **inverse matrix** method (20 points)

$4x+5y=14$ $4x+5y=14$

$x=7-3y$ $x+3y=7$

The matrix form of this system $Ax=B$ is $\begin{pmatrix}4 & 5\\ 1 & 3\end{pmatrix}\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}14\\ 7\end{pmatrix}$

$|A|=\begin{vmatrix}4 & 5\\ 1 & 3\end{vmatrix}=3-5=7\neq 0$, So A is invertible. $A^{-1}=\frac{1}{7}\begin{pmatrix}3 & -5\\ -1 & 4\end{pmatrix}=\begin{pmatrix}3/7 & -5/7\\ -1/7 & 4/7\end{pmatrix}$

$\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}3/7 & -5/7\\ -1/7 & 4/7\end{pmatrix}\begin{pmatrix}14\\ 7\end{pmatrix}=\begin{pmatrix}1\\ 2\end{pmatrix}$. So $x=1,\quad y=2$

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b) $DE=\begin{pmatrix}1 & -2\\ 2 & 1\\ 3 & 0\end{pmatrix}\begin{pmatrix}2 & 0 & -1\\ 1 & -3 & -2\end{pmatrix}=\begin{pmatrix}-1 & 6 & 3\\ 5 & -3 & -4\\ 6 & 0 & -3\end{pmatrix}$

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e) |D| is not defined, because it is not square matrix.

f) $d_{32}=0$

g) size(dimension) of E is … 2×3 ……

Q2) Find x if (20 points)

$$\frac{1}{2}\begin{pmatrix}6 & 2\\ x & 7\\ 3y & 2z\end{pmatrix}=\begin{pmatrix}3 & 1\\ 3 & 7/2\\ 1 & 7/2\end{pmatrix} \qquad \begin{pmatrix}3 & 1\\ x/2 & 7/2\\ 3y/2 & z\end{pmatrix}=\begin{pmatrix}3 & 1\\ 3 & 7/2\\ 1 & 7/2\end{pmatrix}, \text{ So } x=6$$

Q3) Solve the following system by **inverse matrix** method (20 points)

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$\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}3/7 & -5/7\\ -1/7 & 4/7\end{pmatrix}\begin{pmatrix}14\\ 7\end{pmatrix}=\begin{pmatrix}1\\ 2\end{pmatrix}$. So $\quad x=1, \quad y=2$

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$$\frac{1}{2}\begin{pmatrix}6 & 2\\ x & 7\\ 3y & 2z\end{pmatrix}=\begin{pmatrix}3 & 1\\ 3 & 7/2\\ 1 & 7/2\end{pmatrix} \qquad \begin{pmatrix}3 & 1\\ x/2 & 7/2\\ 3y/2 & z\end{pmatrix}=\begin{pmatrix}3 & 1\\ 3 & 7/2\\ 1 & 7/2\end{pmatrix}, \text{ So } x=6$$

Q3) Solve the following system by **inverse matrix** method if the solution is given as
HINT: $(A^{-1})^{-1}=A$ and construct the original system. (20 points)

$$X=1/7\begin{pmatrix}3 & -5\\ -1 & 4\end{pmatrix}\begin{pmatrix}14\\ 7\end{pmatrix}=\begin{pmatrix}1\\ 2\end{pmatrix}$$

$$A^{-1}=\begin{pmatrix}3/7 & -5/7\\ -1/7 & 4/7\end{pmatrix} \qquad A=\frac{1}{1/7}\begin{pmatrix}4/7 & 5/7\\ 1/7 & 3/7\end{pmatrix}=\begin{pmatrix}4 & 5\\ 1 & 3\end{pmatrix}.$$ The original system is $\begin{matrix}4x+5y=14\\ x+3y=7\end{matrix}$