

25/3/13

MA1E02 Tutorial Sheet 6.

Week 11 2013

Questions Solve the following two systems of equations using any of the matrix methods.

1.

$$\begin{aligned}x - 2y + 2z &= 3 \\ -x + y + 3z &= 2 \\ x - y - 4z &= -1\end{aligned}$$

2.

$$\begin{aligned}x + 2y + 3z &= 5 \\ 2x - y + 4z &= -2 \\ -y + z &= 1\end{aligned}$$

$$I. \begin{pmatrix} 1 & -2 & 3 & | & 3 \\ -1 & +1 & +3 & | & 2 \\ 1 & -1 & -4 & | & -1 \end{pmatrix}$$

$$i. R_1 + R_2 \begin{pmatrix} 1 & -2 & 3 & | & 3 \\ 0 & -1 & 5 & | & 5 \\ 0 & +1 & -6 & | & -4 \end{pmatrix}$$

$$R_3 \leftrightarrow R_2 \begin{pmatrix} 1 & -2 & 3 & | & 3 \\ 0 & +1 & -6 & | & -4 \\ 0 & -1 & 5 & | & 5 \end{pmatrix}$$

$$ii. R_3 + R_2 \begin{pmatrix} 1 & -2 & 3 & | & 3 \\ 0 & +1 & -6 & | & -4 \\ 0 & 0 & -1 & | & -5 \end{pmatrix}$$

$$iii. R_3 \times (-1) \begin{pmatrix} 1 & -2 & 3 & | & 3 \\ 0 & +1 & -6 & | & -4 \\ 0 & 0 & 1 & | & 5 \end{pmatrix}$$

$$iv. R_2 + 5R_3 \begin{pmatrix} 1 & -2 & 3 & | & 3 \\ 0 & +1 & -6 & | & -4 \\ 0 & 0 & 1 & | & 5 \end{pmatrix}$$

$$v. R_1 - 2R_3 \begin{pmatrix} 1 & -2 & 3 & | & 3 \\ 0 & +1 & -6 & | & -4 \\ 0 & 0 & 1 & | & 5 \end{pmatrix}$$

$$vi. R_1 + 2R_2 = \begin{pmatrix} x & y & z & | & -15 \\ 0 & 1 & 0 & | & -6 \\ 0 & 0 & 1 & | & -1 \end{pmatrix} \quad \begin{aligned}x &= -5 \\ y &= -6 \\ z &= -1\end{aligned}$$

$$2. \begin{pmatrix} 1 & 2 & 3 & | & 5 \\ 2 & -1 & 4 & | & -2 \\ 0 & -1 & 1 & | & 1 \end{pmatrix}$$

$$R_2 - 2R_1 \begin{pmatrix} 1 & 2 & 3 & | & 5 \\ 0 & -5 & -2 & | & -12 \\ 0 & -1 & 1 & | & 1 \end{pmatrix}$$

$$ii. R_2 \leftrightarrow R_3 \begin{pmatrix} 1 & 2 & 3 & | & 5 \\ 0 & -1 & 1 & | & 1 \\ 0 & -5 & -2 & | & -12 \end{pmatrix} R_2 \times (-1) \begin{pmatrix} 1 & 2 & 3 & | & 5 \\ 0 & 1 & -1 & | & -1 \\ 0 & -5 & -2 & | & -12 \end{pmatrix}$$

$$R_3 + 5R_2 \begin{pmatrix} 1 & 2 & 3 & | & 5 \\ 0 & 1 & -1 & | & -1 \\ 0 & 0 & -7 & | & -17 \end{pmatrix} R_3 \times (-1/7) \begin{pmatrix} 1 & 2 & 3 & | & 5 \\ 0 & 1 & -1 & | & -1 \\ 0 & 0 & 1 & | & 17/7 \end{pmatrix}$$

$$R_3 \times (-1/7) \begin{pmatrix} 1 & 2 & 3 & | & 5 \\ 0 & 1 & -1 & | & -1 \\ 0 & 0 & 1 & | & 17/7 \end{pmatrix} R_3 \times 7 \begin{pmatrix} 1 & 2 & 3 & | & 5 \\ 0 & 1 & -1 & | & -1 \\ 0 & 0 & 1 & | & 17 \end{pmatrix}$$

$$R_2 - 2R_3 = \begin{pmatrix} 1 & 2 & 3 & | & 5 \\ 0 & 1 & -1 & | & -1 \\ 0 & 0 & 1 & | & 17 \end{pmatrix}$$

$$R_1 - 3R_3 = \begin{pmatrix} 1 & 2 & 3 & | & 5 \\ 0 & 1 & -1 & | & -1 \\ 0 & 0 & 1 & | & 17 \end{pmatrix}$$

$$1. R_1 - 2R_2 = \begin{pmatrix} 1 & 0 & 5 & | & 7 \\ 0 & 1 & -1 & | & -1 \\ 0 & 0 & 1 & | & 17 \end{pmatrix} \quad \begin{aligned}x &= -36/7 \\ y &= 10/7 \\ z &= 17/7\end{aligned}$$

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$$v. R_1 - 3R_3 \quad \left(\begin{array}{ccc|c} 1 & 2 & 0 & 1 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & 1 \end{array} \right)$$

$$vi. R_1 - 2R_2 = \left(\begin{array}{ccc|c} 1 & 0 & 0 & -9 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & 1 \end{array} \right)$$