

Math 1204 Tot 1 2017

$$\textcircled{1} \text{ (a)} \begin{pmatrix} w & x & y & z \\ 3 & 3 & 4 & -2 & -8 \\ 2 & 2 & 3 & -3 & -5 \\ 2 & -4 & 2 & 2 & 6 \end{pmatrix}$$

Check:

$$R_3 \leftarrow \frac{1}{2} \times R_3$$

$$\begin{pmatrix} 3 & 3 & 4 & -2 & -8 \\ 2 & 2 & 3 & -3 & -5 \\ 1 & -2 & 1 & \textcircled{1} & 3 \end{pmatrix}$$

$$3w + 3x + 4y - 2z$$

$$= 3t - 6 - \frac{8}{3} - \frac{20t}{3} + 2 + \frac{2t}{3}$$

$$= 0t - 6 - 2 = -8 \checkmark$$

$$R_1 \leftarrow R_1 + 2R_3$$

$$R_2 \leftarrow R_2 + 3R_3$$

$$\begin{pmatrix} 5 & \textcircled{-1} & 6 & 0 & -2 \\ 5 & -4 & 6 & 0 & 4 \\ 1 & -2 & 1 & 1 & 3 \end{pmatrix}$$

$$2w + 2x + 3y - 3z$$

$$= 2t - 4 + -2 - \frac{5t}{2} + 1 + \frac{1t}{2}$$

$$= 0t - 5 = -5 \checkmark$$

$$R_2 \leftarrow R_2 - 4R_1$$

$$R_3 \leftarrow R_3 - 2R_1$$

$$\begin{pmatrix} 5 & -1 & 6 & 0 & -2 \\ -15 & 0 & -18 & 0 & 12 \\ -9 & 0 & -11 & 1 & 7 \end{pmatrix}$$

$$2w - 4x + 2y + 2z$$

$$= 2t + 8 - \frac{4}{3} - \frac{5t}{3} - \frac{2}{3} - \frac{1t}{3}$$

$$= 0t + 6 = 6 \checkmark$$

$$R_2 \leftarrow R_2 \times \frac{1}{18}$$

$$\begin{pmatrix} 5 & -1 & 6 & 0 & -2 \\ \frac{5}{6} & 0 & \textcircled{1} & 0 & -\frac{2}{3} \\ -9 & 0 & -11 & 1 & 7 \end{pmatrix}$$

(b)

We need to pick t even to make it into $\frac{1}{3}$'s to give integers

Try $t = -2$

$$w = -2$$

$$x = -2$$

$$y = -\frac{2}{3} + \frac{5}{3} = 1$$

$$z = -\frac{1}{3} + \frac{1}{3} = 0$$

So $w_i = t$

$$R_1 \quad x = -2$$

$$R_2 \quad y = -\frac{2}{3} + \frac{5}{6}t$$

$$R_3 \quad z = -\frac{1}{3} - \frac{1}{6}t$$

$$Q2/ (a) \left(\begin{array}{ccc|c} 3 & 1 & 1 & -1 \\ \textcircled{1} & -2 & 0 & -1 \\ 0 & 1 & 1 & 3 \\ 1 & 3 & 1 & 1 \end{array} \right)$$

$$R1 \leftarrow R1 - 3R2$$

$$R4 \leftarrow R1 - R2$$

$$\left(\begin{array}{ccc|c} 0 & 7 & 1 & 2 \\ 1 & -2 & 0 & -1 \\ 0 & 1 & \textcircled{1} & 3 \\ 0 & 5 & 1 & 2 \end{array} \right)$$

$$R1 \leftarrow R1 - R3$$

$$R4 \leftarrow R4 - R3$$

$$\left(\begin{array}{ccc|c} 0 & 6 & 0 & -1 \\ 1 & -2 & 0 & -1 \\ 0 & 1 & 1 & 3 \\ 0 & 4 & 0 & -1 \end{array} \right)$$

$$R4 \leftarrow R4 \times \frac{1}{4}$$

$$\left(\begin{array}{ccc|c} 0 & 6 & 0 & -1 \\ 1 & -2 & 0 & -1 \\ 0 & 1 & 1 & 3 \\ 0 & \textcircled{1} & 0 & -\frac{1}{4} \end{array} \right)$$

$$R1 \leftarrow R1 - 6R4$$

$$R2 \leftarrow R2 + 2R4$$

$$R3 \leftarrow R3 - R4$$

$$\left(\begin{array}{ccc|c} 0 & 0 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & -\frac{3}{2} \\ 0 & 0 & 1 & \frac{13}{4} \\ 0 & 1 & 0 & -\frac{1}{4} \end{array} \right) \leftarrow \text{No soln}$$

(b) If we ignore Row 1 then we have

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} -3/2 \\ -1/4 \\ 13/4 \end{pmatrix}$$

Row one represents

$3x + y + z$ and so it should equal

$$\frac{3x-3}{2} - \frac{1}{4} + \frac{13}{4}$$

$$= -\frac{18}{4} - \frac{1}{4} + \frac{13}{4} = \frac{-6}{4} = \frac{-3}{2}$$

so would have to be

$$\left(\begin{array}{ccc|c} 3 & 1 & 1 & -3/2 \end{array} \right)$$

$$\text{(NB } -1 - \frac{1}{2} = -\frac{3}{2} \text{)}$$