$$\left[\begin{array}{cc|c} 1 & 2 & 10 \\ 0 & t & 0 \end{array}\right]$$

For infinite many solutions

$0x + ty = 0$

't' becomes '0'

$0x + 0y = 0 \Rightarrow 0 = 0.$

If 't' = 0 solution has infinite many solution.

(b) For $t = 1$ system has unique sol

$x + 2y = 10$

$y = 0$

$\Rightarrow \boxed{\begin{array}{l} x = 10 \\ y = 0 \end{array}} \Rightarrow$ Unique

(c) The value of 't' can be

$t = \{\mathbb{R} - 0\}$

't' can be any real number except zero for particular solution

Linear Algebra

Q1

$$x + 2y = 10$$
$$3x + (6+t)y = 30$$

In Matrix form.

$$\left[\begin{array}{cc|c} 1 & 2 & 10 \\ 3 & 6+t & 30 \end{array}\right]$$

First we make echlon form.

$$R_2 - 3R_1 \left[\begin{array}{cc|c} 1 & 2 & 10 \\ 3 & 6+t & 30 \end{array}\right]$$

Q3

$P(x) = ax^2 + bx + c$

Points $(1,-5), (-1,1), (2,7)$

First eq $\quad a(1)^2 + b(1) + c = -5$

$a + b + c = -5 \rightarrow 1$

2nd eq. $\quad a(-1)^2 + b(-1) + c = 1$

$a - b + c = 1 \rightarrow 2$

3rd eq. $\quad a(2)^2 + b(2) + c = 7$

$4a + 2b + c = 7 \rightarrow 3$

$a + b + c = -5$

$a - b + c = 1$

$4a + 2b + c = 7$

In matrix form

$$\begin{bmatrix} 1 & +1 & 1 \\ 1 & -1 & 1 \\ 4 & 2 & 1 \end{bmatrix} = \begin{bmatrix} -5 \\ 1 \\ 7 \end{bmatrix}$$

In augmented form

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & -5 \\ 1 & -1 & 1 & 1 \\ 4 & 2 & 1 & 7 \end{array}\right]$$

Q3 remaining

$$R_1 - R_2 \begin{bmatrix} 1 & 1 & 1 & | & -5 \\ 0 & 1 & 0 & | & -3 \\ 0 & 0 & 1 & | & -7 \end{bmatrix}$$

$$R_1 - R_3 \begin{bmatrix} 1 & 0 & 1 & | & -2 \\ 0 & 1 & 0 & | & -3 \\ 0 & 0 & 1 & | & -7 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 & | & +5 \\ 0 & 1 & 0 & | & -3 \\ 0 & 0 & 1 & | & -7 \end{bmatrix}$$

$$\boxed{c = -7}$$

$$\boxed{b = -7}$$

$$\boxed{a = +5}$$

Q4
$$
\begin{aligned}
2x + y + z - 2w &= 1 \\
3x - 2y + z - 6w &= -2 \\
x + y - z - w &= -1 \\
6x \quad 0 \quad + z - 9w &= -2 \\
5x - y + 2z - 8w &= 3
\end{aligned}
$$

In matrix form.

$$
\left[\begin{array}{cccc|c}
2 & 1 & 1 & -2 & 1 \\
3 & -2 & 1 & -6 & -2 \\
1 & 1 & -1 & -1 & -1 \\
6 & 0 & 1 & -9 & -2 \\
5 & -1 & 2 & -8 & 3
\end{array}\right]
$$

we need echlon form.

$$
R_1 - R_3 \quad
\left[\begin{array}{cccc|c}
2 & 1 & 1 & -2 & 1 \\
3 & -2 & 1 & -6 & -2 \\
1 & 1 & -1 & -1 & -1 \\
6 & 0 & 1 & -9 & -2 \\
5 & -1 & 2 & -8 & 3
\end{array}\right]
$$

$$
\begin{array}{l}
\\
R_2 \to R_2 - 3R_1 \\
R_3 - R_1 \\
R_4 \to R_4 - 6R_1 \\
R_5 \to R_5 - 5R_1
\end{array}
\left[\begin{array}{cccc|c}
1 & 0 & 2 & -1 & 2 \\
3 & -2 & 1 & -6 & -2 \\
1 & 1 & -1 & -1 & -1 \\
6 & 0 & 1 & -9 & -2 \\
5 & -1 & 2 & -8 & 3
\end{array}\right]
$$

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$$R_2+R_3\left[\begin{array}{cccc|c} 1 & 0 & 2 & -1 & 2 \\ 0 & -2 & -5 & -3 & -8 \\ 0 & 1 & -3 & 0 & -3 \\ 0 & 0 & -11 & -3 & -14 \\ 0 & -1 & -8 & -3 & -7 \end{array}\right]$$

$$-1R_2\left[\begin{array}{cccc|c} 1 & 0 & 2 & -1 & 2 \\ 0 & -1 & -8 & -3 & -11 \\ 0 & 1 & -3 & 0 & -3 \\ 0 & 0 & -11 & -3 & -14 \\ 0 & -1 & -8 & -3 & -7 \end{array}\right]$$

$$\begin{array}{c} R_3-R_2 \\ R_5+R_2 \end{array}\left[\begin{array}{cccc|c} 1 & 0 & 2 & -1 & 2 \\ 0 & 1 & 8 & 3 & 11 \\ 0 & 1 & -3 & 0 & -3 \\ 0 & 0 & -11 & -3 & -14 \\ 0 & -1 & -8 & -3 & -7 \end{array}\right]$$

$$-\frac{1}{11}R_3\left[\begin{array}{cccc|c} 1 & 0 & 2 & -1 & 2 \\ 0 & 1 & 8 & 3 & 11 \\ 0 & 0 & -11 & -3 & -14 \\ 0 & 0 & -11 & -3 & -14 \\ 0 & 0 & -11 & -3 & -10 \end{array}\right]$$

$$R_4 \to R_4+11R_3\left[\begin{array}{cccc|c} 1 & 0 & 2 & -1 & 2 \\ 0 & 1 & 8 & 3 & 11 \\ 0 & 0 & 1 & +\frac{3}{11} & +\frac{14}{11} \\ 0 & 0 & -11 & -3 & -14 \\ 0 & 0 & -11 & -3 & -10 \end{array}\right]$$

$$\left[\begin{array}{cccc|c} 1 & 0 & 2 & -1 & 2 \\ 0 & 1 & 8 & 3 & 11 \\ 0 & 0 & 1 & 3/11 & 14/11 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -10 \end{array}\right]$$

The last row.

$$\left[\begin{array}{cccc|c} 0 & 0 & 0 & 0 & -10 \end{array}\right]$$

which is not possible so the given system is inconsistent the given system is incons

Q8

Q5 The given system.

$$\begin{aligned} x + 2y - 3z &= a \\ 2x + 3y + 3z &= b \\ 5x + 9y - 6z &= c \end{aligned}$$

The Augmented matrix is.

$$\left[\begin{array}{ccc|c} 1 & 2 & -3 & a \\ 2 & 3 & +3 & b \\ 5 & 9 & -6 & c \end{array}\right]$$

First we make echleon form.

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$$R_2 \to R_2 - 2R_1 \begin{bmatrix} 1 & 2 & -3 & | & a \\ 2 & 3 & +3 & | & b \\ 5 & 9 & -6 & | & c \end{bmatrix}$$

$$R_3 \to R_3 - 5R_1 \begin{bmatrix} 1 & 2 & -3 & | & a \\ 0 & -1 & 9 & | & b-2a \\ 5 & 9 & -6 & | & c \end{bmatrix}$$

$$R_3 \to R_3 - 1R_2 \begin{bmatrix} 1 & 2 & -3 & | & a \\ 0 & -1 & 9 & | & b-2a \\ 0 & -1 & +9 & | & c-5a \end{bmatrix}$$

$$R_3 + R_2 \begin{bmatrix} 1 & 2 & -3 & | & a \\ 0 & +1 & -9 & | & -b+2a \\ 0 & -1 & 9 & | & c-5a \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 & -3 & | & a \\ 0 & 1 & -9 & | & -b+2a \\ 0 & 0 & 0 & | & c-5a-b+2a \end{bmatrix}$$

The system is consistent only if

$$c - 5a - b + 2a = 0$$

$$\boxed{c - 3a - b = 0}$$

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Q2 The given system is.

$$3x \quad -2z = 4$$
$$x \quad -4y \quad +z = -5$$
$$-2x \quad +3y \quad +2z = 9$$

$R_1 \leftrightarrow R_2$
$$\left[\begin{array}{ccc|c} 3 & 0 & -2 & 4 \\ 1 & -4 & 1 & -5 \\ -2 & 3 & 2 & 9 \end{array}\right]$$

$R_2 \to R_2 - 3R_1$
$R_3 \to R_3 + 2R_1$
$$\left[\begin{array}{ccc|c} 1 & -4 & 1 & -5 \\ 3 & 0 & -2 & 4 \\ -2 & 3 & 2 & 9 \end{array}\right]$$

$\frac{1}{12} R_2$
$$\left[\begin{array}{ccc|c} 1 & -4 & 1 & -5 \\ 0 & 12 & -5 & 19 \\ 0 & -5 & 4 & -1 \end{array}\right]$$

$R_3 \to R_3 + 5R_2$
$$\left[\begin{array}{ccc|c} 1 & -4 & 1 & -5 \\ 0 & 1 & -5/12 & 19/12 \\ 0 & -5 & 4 & -1 \end{array}\right]$$

$$\left[\begin{array}{ccc|c} 1 & -4 & 1 & -5 \\ 0 & 1 & -5/12 & 19/12 \\ 0 & 0 & 4 - 25/12 & 95/12 - 1 \end{array}\right]$$

$$z \cdot 4 - \frac{25}{12} = \frac{95}{12} - 1$$

$$z \cdot \frac{48-25}{12} = \frac{95-12}{12}$$

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$= z \cdot \frac{23}{12} = \frac{83}{12}$

$= z = \frac{83}{\cancel{12}} \cdot \frac{\cancel{12}}{23}$

$= \frac{83}{23} \approx 3.60$

$z \neq 1$ so $x \neq 1$ so no sol.