Q_1 (Part 2)

$$\left[\begin{array}{ccc|c} 2 & 0 & k & 1 \\ 0 & 3 & 1 & 2 \\ 0 & k & 0 & 4 \end{array}\right] \xrightarrow{\frac{1}{2}R_1} \left[\begin{array}{ccc|c} 1 & 0 & \frac{k}{2} & \frac{1}{2} \\ 0 & 3 & 1 & 2 \\ 0 & k & 0 & 4 \end{array}\right]$$

$$= \xrightarrow{\frac{1}{3}R_2} \left[\begin{array}{ccc|c} 1 & 0 & k/2 & 1/2 \\ 0 & 1 & 1/3 & 2/3 \\ 0 & k & 0 & 4 \end{array}\right] = \xrightarrow{R_3 - kR_2} \left[\begin{array}{ccc|c} 1 & 0 & k/2 & 1/2 \\ 0 & 1 & 1/3 & 2/3 \\ 0 & 0 & -\frac{k}{3} & 4-\frac{2k}{3} \end{array}\right]$$

$$= \xrightarrow{-\frac{3}{k}R_3} \left[\begin{array}{ccc|c} 1 & 0 & k/2 & 1/2 \\ 0 & 1 & 1/3 & 2/3 \\ 0 & 0 & 1 & \left(-\frac{3}{k}\right)\left(4-\frac{2k}{3}\right) \end{array}\right] = \left[\begin{array}{ccc|c} 1 & 0 & k/2 & 1/2 \\ 0 & 1 & 1/3 & 2/3 \\ 0 & 0 & 1 & \frac{2}{k}(k-6) \end{array}\right]$$

$$\left(-\frac{3}{k}\right)\left(\frac{12-2k}{3}\right) = \frac{2(6-k)}{k} = \frac{2(k-6)}{k}$$

$$\xrightarrow{R_1 - \frac{k}{2}R_3} \left[\begin{array}{ccc|c} 1 & 0 & 1 & \frac{1}{2}-(k-6) \\ 0 & 1 & 1/3 & 2/3 \\ 0 & 0 & 1 & \frac{2}{k}(k-6) \end{array}\right]$$

$$\left(\frac{13}{2}-k\right) - \left(\frac{2(k-6)}{k}\right)$$

$$= \frac{13-2k}{2} - \frac{2k-12}{k}$$

$$= \frac{2k}{}$$

$$= \left[\begin{array}{ccc|c} 1 & 0 & 1 & \frac{13}{2}-k \\ 0 & 1 & 1/3 & 2/3 \\ 0 & 0 & 1 & \frac{2}{k}(k-6) \end{array}\right]$$

$$\frac{2}{k}(k-6) = \frac{2k}{k} - \frac{12}{k} + 2 - \frac{12}{k}$$

$$\frac{2k}{k}$$

$$\rightarrow \begin{bmatrix} 1 & 0 & 1 & \frac{13}{2} - k \\ 0 & 1 & \frac{1}{3} & \frac{2}{3} \\ 0 & 0 & 1 & 2 - \frac{12}{k} \end{bmatrix}$$

$$\frac{2}{3} - \frac{2(k-6)}{3k}$$

$$\frac{2k - 2k + 12}{3k}$$

$$= \frac{4}{k}$$

$$R_2 - \frac{1}{3}R_3 \rightarrow \begin{bmatrix} 1 & 0 & 1 & \frac{13}{2} - k \\ 0 & 1 & 0 & \frac{4}{k} \\ 0 & 0 & 1 & 2 - \frac{12}{k} \end{bmatrix}$$

Hence, $z = 2 - \frac{12}{k}$

or, $z = \frac{2k - 12}{k}$

$2k - 2k - 12 = 2(k-6)$

$z - 2 = -\frac{12}{k}$

$2 - z = \frac{12}{k}$

$k = \left(\frac{12}{2-z}\right)$

Now, $x - y + kz = 1$

$\Rightarrow x - y + \left(\frac{12}{2-z}\right)z = 1$

$\Rightarrow x - y + \frac{12z}{2-z} = 1$

$\Rightarrow \frac{x(2-z) - y(2-z) + 12z}{2-z} = 1$

$\Rightarrow 2x - xz - 2y + yz + 12z = 2 - z$

$\Rightarrow 2x - xz - 2y + yz + 12z - 2 + z = 0$

$\Rightarrow$