Module 14 Final

1) ~~ROW Reduce~~ For below system, find all solutions or demonstrate that no solution exists.

$5x - 3y + z = 7$
$2x + 3y - z = 0$
$8x + 9y - 3z = 2$

lets first row reduce this shit

$$\begin{bmatrix} 5 & -3 & 1 & 7 \\ 2 & 3 & -1 & 0 \\ 8 & 9 & -3 & 2 \end{bmatrix} \rightarrow -4 \cdot R_2 + R_3 \rightarrow R_3$$

$$\begin{bmatrix} 5 & -3 & 1 & 7 \\ 2 & 3 & -1 & 0 \\ 0 & -3 & 1 & 2 \end{bmatrix} \rightarrow \frac{-2}{5} R_1 + R_2 \rightarrow R_2 \begin{bmatrix} 5 & -3 & 1 & 7 \\ 0 & 21/5 & -7/5 & -14/5 \\ 0 & -3 & 1 & 2 \end{bmatrix} 5/7\, R_2$$

$$\frac{6}{5} + \frac{15}{5} = \frac{21}{5} \qquad \frac{-2}{5} + \frac{-5}{5} = \frac{-7}{5}$$

$$\begin{bmatrix} 5 & -3 & 1 & 7 \\ 0 & 3 & -1 & -2 \\ 0 & -3 & 1 & 2 \end{bmatrix} \rightarrow \begin{bmatrix} 5 & -3 & 1 & 7 \\ 0 & 3 & -1 & -2 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

so because of R_3, can have infinite number of solutions

From 2nd equation $3y - z = -2$ so let $y = a$

$z = 3y + 2$ then $z = 3a + 2$

So $5x = 0 + 3a - a - 7$

so $x = 1$

$$\boxed{\begin{array}{l} x = 1,\ y = a,\ z = 3a + 2 \\ \text{Infinite solutions} \end{array}}$$