2) consider $3x-y+2z=1$
$-x+2y+4z=3$
$2x+y+az=b$

$$\left(\begin{array}{ccc|c} 3 & -1 & 2 & 1 \\ -1 & 2 & 4 & 3 \\ 2 & 1 & a & b \end{array}\right) \xrightarrow[\frac{-2}{3}R2+R3]{\frac{1}{3}R1+R2} \left(\begin{array}{ccc|c} 3 & -1 & 2 & 1 \\ 0 & 5/3 & 14/3 & 10/3 \\ 0 & 5/3 & a-\frac{4}{3} & b-\frac{2}{3} \end{array}\right) \xrightarrow[3\cdot R3]{3\cdot R2} \left(\begin{array}{ccc|c} 3 & -1 & 2 & 1 \\ 0 & 5 & 14 & 10 \\ 0 & 5 & 3a-4 & 3b-2 \end{array}\right) \xrightarrow{-R2+R3} \left(\begin{array}{ccc|c} 3 & -1 & 2 & 1 \\ 0 & 5 & 14 & 10 \\ 0 & 0 & 3a-18 & 3b-12 \end{array}\right)$$

$$\xrightarrow{\frac{1}{3}\cdot R3} \left(\begin{array}{ccc|c} 3 & -1 & 2 & 1 \\ 0 & 5 & 14 & 10 \\ 0 & 0 & a-6 & b-4 \end{array}\right)$$

a) The system is inconsistent iff $a-6=0$ and $b-4\neq 0 \Leftrightarrow a=6$ and $b\neq 4$

That is to say when $a=6$ and $\forall b\in\mathbb{R}\setminus\{4\}$ the system is inconsistent.

b) There is a unique solution just in the case that $a-6\neq 0$ and b any real

i.e. $\forall a\in\mathbb{R}\setminus\{6\}$ and $\forall b\in\mathbb{R}$

c) There are infinitely many solutions whenever $a-6=0$ and $b-4=0$. ie. $a=6, b=4$