

SYSTEMS OF LINEAR EQUATIONS (PART II)

Substitution with larger systems

$$\text{Ex: } \begin{cases} 2x + 3y + 4z = 20 \\ x - y + z = 2 \\ 3x + 2y - 5z = -8 \end{cases}$$

$$2x = 20 - 3y - 4z \Rightarrow x = \frac{20 - 3y - 4z}{2} \quad \left. \begin{array}{l} 20 - 3y - 4z \\ 2 \end{array} \right\} = 2 + y - z$$

$$x = 2 + y - z$$

$$3x = -8 - 2y + 5z \Rightarrow x = \frac{-8 - 2y + 5z}{3} \quad \left. \begin{array}{l} -8 - 2y + 5z \\ 3 \end{array} \right\} = \frac{-8 - 2y + 5z}{3}$$

$$\left. \begin{cases} 20 - 3y - 4z = 4 + 2y - 2z \\ 6 + 3y - 3z = -8 - 2y + 5z \end{cases} \right\} \begin{cases} 5y + 2z = 16 \\ 5y - 8z = -14 \end{cases}$$

$$\Rightarrow 5y = 16 - 2z \Rightarrow y = \frac{16 - 2z}{5}$$

$$\Rightarrow 5y = -14 + 8z \Rightarrow y = \frac{-14 + 8z}{5}$$

$$\Rightarrow 16 - 2z = -14 + 8z \Rightarrow 30 = 10z \Rightarrow \frac{30}{10} = \boxed{z = 3}$$

$$y = \frac{16 - 2z}{5} = \frac{16 - 2 \cdot 3}{5} = \frac{10}{5} = 2 \quad \boxed{y = 2}$$

$$x = \frac{20 - 3y - 4z}{2} = \frac{20 - 3 \cdot 2 - 4 \cdot 3}{2} = \frac{20 - 6 - 12}{2} = \frac{2}{2} = \boxed{1 = x}$$

$$\text{EX: } \begin{cases} 2x + 3y + 4z = 20 \\ 4x + 6y + 8z = 15 \\ 3x + 2y - 5z = -8 \end{cases} \Rightarrow x = \frac{20 - 3y - 4z}{2}$$

$$\Rightarrow x = \frac{15 - 6y - 8z}{4}$$

$$\Rightarrow x = \frac{-8 - 2y + 5z}{3}$$

$$\frac{20 - 3y - 4z}{2} = \frac{15 - 6y - 8z}{4} \Rightarrow 80 - 12y - 16z = 30 - 12y - 16z$$

$\Rightarrow 80 = 30$ ABSURD system is inconsistent
no solution