

**7-3 Multivariable Linear Systems**

**Day 1**

**I. Back Substitution**

Ex 1)  $2x - y + 5z = 24$   
 $y + 2z = 4$   
 $z = 6$

①  $y + 2(6) = 4$   
 $y + 12 = 4$

$y = -8$

$(-7, -8, 6)$

②  $2x - -8 + 5(6) = 24$

$2x + 8 + 30 = 24$

$2x + 38 = 24$

$2x = -14$

$x = -7$

**II. Solve Algebraically using Gaussian Elimination.** (look at page 478)

Ex 2)  $2x + y + 3z = 1$   
 $2x + 6y + 8z = 3$   
 $6x + 8y + 18z = 5$

① eq. 1 + 2 "X"  
 $2x + y + 3z = 1$   
 $+ -2x - 6y - 8z = -3$   
 $-5y - 5z = -2$

② eq. 2 + 3 "X"  
 $-6x - 18y - 24z = -9$   
 $+ 6x + 8y + 18z = 5$   
 $-10y - 6z = -4$

③  $-5y - 5z = -2$   
 $-10y - 6z = -4$

$4y + 10z = 4$   
 $-10y - 6z = -4$   
 $4z = 0$   
 $z = 0$

④  $-5y - 5(0) = -2$   
 $-5y = -2$   
 $y = \frac{2}{5}$

⑤  $2x + \frac{2}{5} + 3(0) = 1$   
 $2x + \frac{2}{5} = 1$

$2x = 1 - \frac{2}{5}$   
 $(\frac{1}{2}) 2x = \frac{3}{5} (\frac{1}{2})$   
 $x = \frac{3}{10}$

$(\frac{3}{10}, \frac{2}{5}, 0)$

$$\begin{aligned} \text{Ex 3) } x - 3y + z &= 1 \\ 2x - y - 2z &= 2 \\ x + 2y - 3z &= -1 \end{aligned}$$

no solutions

$$\begin{aligned} \text{Ex 4) } x + y - 3z &= -1 \\ y - z &= 0 \\ -x + 2y &= 1 \end{aligned}$$

① eq. 1 & 3 "X"

$$\begin{array}{r} x + y - 3z = -1 \\ -x + 2y = 1 \\ \hline 3y - 3z = 0 \end{array}$$

②  $(-3) y - z = 0(-3)$

$$\begin{array}{r} 3y - 3z = 0 \\ -3y + 3z = 0 \\ + 3y - 3z = 0 \\ \hline 0 = 0 \end{array}$$

③  $y - z = 0$

$$\begin{array}{r} x \quad y \quad z \quad y = z \\ (2z - 1, z, z) \end{array}$$

④  $-x + 2z = 1$

$$\begin{array}{r} -x = -2z + 1 \\ \frac{-x}{-1} = \frac{-2z + 1}{-1} \\ x = 2z - 1 \end{array}$$

$$\begin{aligned} (-2) \text{ Ex 5) } & x - 2y + z = 2 \quad (-2) \\ & 2x - y - z = 1 \end{aligned}$$

① eq 1 + 2 "x"

$$\begin{aligned} -2x + 4y - 2z &= -4 \\ 2x - y - z &= 1 \end{aligned}$$

$$3y - 3z = -3$$

$$\frac{3y}{3} = \frac{3z-3}{3}$$

$$y = z - 1$$

$$\begin{array}{ccc} x & y & z \\ (z, & z-1, & z) \end{array}$$

②

$$2x - (z-1) - z = 1$$

$$2x - z + 1 - z = 1$$

$$2x - 2z + 1 = 1$$

$$2x = 2z$$

$$x = z$$