



**Sri Lanka Institute of Information Technology**  
**B. Sc Degree in IT/IS/CSN, Diploma in Information Technology**  
**Year 01 – Semester I – 2017**  
**Mathematics for Computing (IT1030)**  
**Tutorial 11**

1. Solve the following systems of linear equations using Cramer's rule:

a)  $x_1 + x_3 = 1$   
 $x_2 - x_3 = 3$   
 $2x_1 + x_2 = -1$

$x_1 = -5$   
 $x_2 = 9$   
 $x_3 = 6$

b)  $x_1 + 7x_2 + x_3 = 1$   
 $x_2 - x_3 = 3$   
 $2x_1 + x_2 + 10x_3 = -1$

$x_1 = 188/5$   
 $x_2 = -21/5$   
 $x_3 = -36/5$

c)  $x_1 + x_2 + x_3 = 1,$   
 $ax_1 + bx_2 + cx_3 = d,$  do not try to do  
 $a^2x_1 + b^2x_2 + c^2x_3 = d^2,$

2. Show that the following sets of equations are inconsistent.

a) 
$$\begin{aligned} x_1 + 2x_2 + x_3 &= 3, \\ x_1 - 3x_2 + 2x_3 &= 4, \\ 5x_1 + 5x_2 + 6x_3 &= 1; \end{aligned} \quad \begin{bmatrix} 1 & 2 & 1 & 3 \\ 0 & -5 & 1 & 1 \\ 0 & 0 & 0 & -17 \end{bmatrix}$$

b) 
$$\begin{aligned} x_1 + x_2 + x_3 &= 2, \\ x_1 + x_3 + 2x_4 &= 3, \\ x_1 + x_2 + x_4 &= 4, \\ -x_2 + 2x_3 &= 2, \end{aligned} \quad \begin{bmatrix} 1 & 1 & 1 & 0 & 2 \\ 0 & -1 & 0 & 1 & 1 \\ 0 & 0 & -1 & 1 & 2 \\ 0 & 0 & 0 & 1 & 5 \end{bmatrix}$$

c) 
$$\begin{aligned} x_1 + x_2 + x_3 - x_4 &= 10, \\ x_1 - x_2 - x_3 &= 1, \\ 4x_1 - 2x_2 - 2x_3 - x_4 &= 5. \end{aligned} \quad \left. \vphantom{\begin{aligned} x_1 + x_2 + x_3 - x_4 &= 10, \\ x_1 - x_2 - x_3 &= 1, \\ 4x_1 - 2x_2 - 2x_3 - x_4 &= 5. \end{aligned}} \right\} 4$$

3. Find the value of  $a$  for which the linear equations

$$ax - y + 2z = 1,$$

$$x + 2y - az = 2,$$

$$4x + y - 2z = 2,$$

has no solutions.

4. Determine the complete set of values for  $a$  and  $b$  that make the equations

$$x + y - z = 2$$

$$2x + 3y + z = 3$$

$$5x + 7y + az = b$$

i) has a unique solution      ii) no solutions      iii) an infinite set of solutions.

5. Find the inverses of the following matrices.

a) 
$$\begin{bmatrix} 6 & -3 & 6 \\ 3 & 6 & 6 \\ -12 & -3 & 6 \end{bmatrix}$$

b) 
$$\begin{bmatrix} 1 & -1 & 2 \\ 1 & 2 & 1 \\ -4 & -1 & 2 \end{bmatrix}$$

7. Find all solution of determinant equation

$$\begin{vmatrix} 1-k & 2 & -1 \\ 2 & 1-k & -1 \\ -1 & -1 & 2-k \end{vmatrix} = 0.$$

What are the values of  $k$  for which the following set of equations has nontrivial solutions?

$$\begin{aligned} (1-k)x + 2y - z &= 0 \\ 2x + (1-k)y - z &= 0 \\ -x - y + (2-k)z &= 0 \end{aligned}$$

6. Find the solutions of the following linear equations using the results from question 5.

a)

$$\begin{aligned} 6x - 3y + 6z &= 1 \\ 3x + 6y + 6z &= 5 \\ -12x - 3y + 6z &= 2 \end{aligned}$$

b)

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