



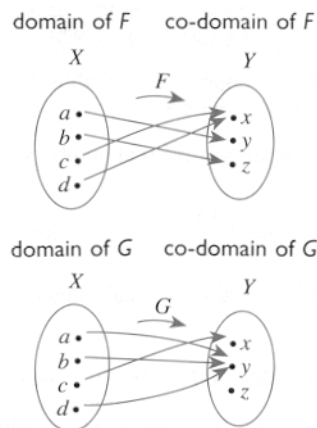
**Sri Lanka Institute of Information Technology**  
**B. Sc Degree in IT/IS/CSN, Diploma in Information Technology**  
**Year 01 – Semester I – 2017**  
**Mathematics for Computing (IT1030)**  
**Tutorial 06**

01. a. Find all functions from  $X = \{a, b\}$  to  $Y = \{u, v\}$   
 b. Find all functions from  $X = \{a, b, c\}$  to  $Y = \{u\}$   
 c. Find all functions from  $X = \{a, b, c\}$  to  $Y = \{u, v\}$
02. Define functions  $f$  and  $g$  from  $\mathbf{R}$  to  $\mathbf{R}$  by the formulas: for all  $x \in \mathbf{R}$ ,

$$f(x) = 2x \text{ and } g(x) = \frac{2x^3 + 2x}{x^2 + 1}$$

Show that  $f = g$ .

03. Let  $X = \{a, b, c, d\}$  and  $Y = \{x, y, z\}$ . Define functions  $F$  and  $G$  by the arrow diagrams below.



04. Let  $X = \{1, 2, 3\}$ ,  $Y = \{1, 2, 3, 4\}$ , and  $Z = \{1, 2\}$
- a. Define a function  $f : X \rightarrow Y$  that is one-to-one but not onto.
- b. Define a function  $g : X \rightarrow Z$  that is onto but not one-to-one.
05. A function  $f$  is defined on a set of real numbers. Determine whether or not  $f$  is one-to-one and justify your answer.

$$f(x) = \frac{x+1}{x} \text{ for all real number } x \neq 0$$

06. Let a function  $f: [0, 2] \longrightarrow [-1, 2]$  be given by,  
$$f(x) = \sqrt{x} - 1$$

Decide whether  $f$  is an onto function.

07. Let a function  $f: R \longrightarrow R$  be given by,  
$$f(x) = |x|$$

Decide whether  $f$  has the inverse function and construct it.

08. Find the inverse of the following functions.

a)  $f: R \rightarrow R$ ,  $f(x) = \frac{2x+3}{3x+5}$  b)  $f: R \rightarrow R$ ,  $f(x) = \frac{x-1}{6x+3}$

### Further Exercises

1. Let  $f_1$  and  $f_2$  be functions from  $R$  to  $R$  such that  $f_1 = x^2$  and  $f_2 = x - x^2$ . what are the functions  $f_1 + f_2$  and  $f_1 f_2$ ?
2. Show that  $f(x) = x^2$  is not one-to-one?
3. Let  $f$  be the function from  $\{a, b, c, d\}$  to  $\{1, 2, 3, 4\}$  with  $f(a)=4$ ,  $f(b)=2$ ,  $f(c)=1$ , and  $f(d)=3$ . Is  $f$  a bijection?
4. Let  $f: Z \rightarrow Z$  be such that  $f(x) = x + 1$ . Is  $f$  invertible, and if it is, what is its inverse?
5. Let  $f$  be the function from  $R$  to  $R$  with  $f(x) = x^2$ . Is  $f$  invertible?
6. Prove that if  $n$  is an integer, then  $\left\lfloor \frac{n}{2} \right\rfloor = \frac{n}{2}$  if  $n$  is even and  $\frac{(n-1)}{2}$  if  $n$  is odd.
7. Draw the graph of the function  $f(x) = \lfloor x \rfloor$ .