[Glossary]

Elementry Theory of Functions

Subject:	Business Economics
Course:	B. A. (Hons.), 1st Semester, Undergraduate
Paper No. & Title:	Paper – 202 Mathematics for Business Economics
Unit No. & Title:	Unit – 1 Basic Concepts
Lecture No. & Title:	Lecture – 2 Elementry Theory of Functions

Glossary

Ordered Pair

When we want order to be important, we write (a,b). We call it an ordered pair. We emphasize that $(a,b) \neq (b,a)$ unless $a = b$. Also $(a,b) = (c,d)$ iff $a = b$ and $c = d$.

Cartesian Product

If two sets X and Y are given their Cartesian Product which is denoted by $X \times Y$ is defined as: $X \times Y = \{(\mathrm{a}, \mathrm{b}) | \mathrm{a} \in X \text{ and } \mathrm{b} \in Y\}$

Rectangular Coordinate Plane

A plane with two orthogonal lines meeting at a point O which is referred to as the origin, is called the Rectangular Coordinate Plane. If necessary after rotating the plane, the horizontal line through origin is most often named as the x-axis and the vertical line through O is named as the y-axis. Further the right-half x-axis is called the positive x-axis and the left-half x-axis is called the negative x-axis. Similarly upper-half of y-axis is called the positive y-axis and the lower-half y-axis is called the negative y-axis. The elements or points of $\mathbb{R} \times \mathbb{R}$ can be plotted on Rectangular Coordinate Plane.

Relation

A relation R is a subset of $X \times Y$. Any such subset establishes a relation between certain points y of set Y and certain points x of the set X.

Function

When a relation R i.e. a subset of $X \times Y$ is such that for each x in X there is uniquely related y, we say that this relation defines a function. In this case we write: $y = f(x)$ whenever (x, y) is in R.

One-to-one or one-one or injective function:

$f: X \to Y$ is one-to-one or injective if

$for\ all\ x_1 \neq x_2\ in\ X\ we\ must\ have\ f(x_1) \neq f(x_2)$

In other words it means that if

$f(x_1) = f(x_2)\ then\ x_1 = x_2\ for\ all\ x_1, x_2\ in\ X$

Onto or surjective function

We say that the function is onto if the range is the co-domain. The phrase “surjective function” is also used for “onto function”. That is $f: X \to Y$ is onto if for each y in Y there exists x in X such that $f(x) = y$.

Bijective function

A function which is both injective as well as surjective is called a bijective function. In other words a bijective functions is both 1-1 and onto.

Inverse function

Suppose $y = f(x)$ is a function and if we write

$x = f^{-1}(y)$ if and only if $y = f(x)$

then clearly f^{-1} will be defined on the range of f and more over it will be one-one iff f is one-one and also it will be one-many and therefore not a function iff f is many-one. So if we want f^{-1} to be a function f has to be one-one function. It will be defined on the range of f.

Increasing function

If a function produces successively larger and larger values when we take successively larger and larger values from the domain, we say that the function is monotonically increasing or simply increasing i.e. a function is increasing if $x_1 < x_2 \; implies \; that \; f(x_1) < f(x_2)$

Decreasing function

If a function produces successively smaller and smaller values when we take successively larger and larger values from the domain, we say that the function is monotonically decreasing or simply decreasing i.e. a function is decreasing if $x_1 < x_2 \; implies \; that \; f(x_1) > f(x_2)$