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Coimbatore- 49

DEPARTMENT OF MATHEMATICS

25UCU305: DISCRETE MATHEMATICS WITH PROBABILITY AND HYPOTHESIS TESTING

Functions

Ms.P.Devie Abirami, Assistant Professor,

Department of Mathematics

What is a Function?

A **function** is a special relation where **every input has a unique output.**

Example:

$f(x) = x^2 \rightarrow$ each x gives exactly one output.

Domain, Co-domain & Range

- **Domain:** All possible input values
- **Co-domain:** Set containing possible outputs
- **Range:** Actual outputs obtained

Example:

For $f(x) = x^2$, $x \in \mathbb{R}$

Range = $[0, \infty)$

Types of Functions

1. One-to-One (Injective)
2. Onto (Surjective)
3. One-to-One and Onto (Bijective)
4. Into
5. Many-to-One
6. Constant Function
7. Identity Function
8. Polynomial, Rational, Algebraic
9. Exponential & Logarithmic
10. Even & Odd Functions

Types of Functions

1. Injective (One-to-One):

Each input maps to a **unique, non-repeating output.**

2. Surjective (Onto):

Every element in the co-domain is **reached by the function.**

3. Bijective:

A function that is **both injective and surjective**, giving a perfect one-to-one match.

4. Many-to-One:

Multiple inputs map to the **same single output.**

5. Constant Function:

All inputs give the **same constant output**, forming a horizontal line.

Types of Functions

6. Identity Function:

The output is **exactly the same** as the input (f(x) = x).

7. Polynomial Function:

A function formed using **powers of x** with real coefficients.

8. Rational Function:

A function expressed as a **ratio of two polynomials.**

9. Exponential Function:

A function where the **variable appears in the exponent.**

10. Logarithmic Function:

A function that is the **inverse of an exponential function**, using logarithms.

Type	Definition	Example
Injective	One-to-one	$2x+1$
Surjective	Onto	x^3
Bijective	1–1 & Onto	$x+2$
Constant	$f(x)=c$	7
Identity	$f(x)=x$	x
Many-to-one	Multiple inputs → same output	x^2

THANK YOU