



**TRINITY COLLEGE FOR WOMEN  
NAMAKKAL  
Department of Mathematics**

**NUMERICAL Methods  
21UMA08 - EVEN Semester**

**Introduction to Numerical Methods**

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# What is Numerical Analysis

It is the study of algorithms that numerical approximation for the problem of mathematical analysis.

## Study of algorithms

Create, analyse and implement algorithms.

## Successive approximation

Solving problems numerically and approximately.

These methods are affected by three types of errors

1. Round errors
2. Truncation errors
3. Errors due to find representation of numbers such as  $\frac{1}{2}$ ,  $\frac{3}{7}$ ,  $\frac{5}{9}$  etc.

## Mathematical analysis:

Problems of continuous mathematics such problems originate generally from real – world applications of algebra, geometry and calculus and they involve variables which vary continuously.

## Course Brief description

This course is an introduction to basic and classical numerical algorithms. We will describe numerical algorithms for floating point computation, root finding, solving linear systems, interpolation and quadrature. We will also discuss the underlying mathematical principles and theories of these numerical methods and their implementations.

## Field of Numerical Analysis:

1. Numerical linear and non linear algebra.  
Solution of systems of linear and non linear equations, possible with a very large number of variables.
2. Approximation Theory:  
Approximation of functions and methods based on using such approximations.
3. Solving differential and integral equations
4. Effects of computer hardware

## Types of numerical methods

There are many types of numerical methods of them the most commonly used ones may be cited as under.

1. Methods of finding the roots of an equation.  
They include, bisection method, Regula falsi method, secant method, Newton's method and Fixed point iteration method.
2. Methods of solving the system of linear algebraic equations.
  - Gaussian elimination
  - Linear Iterative method
  - LU Factorization method
  - Conjugate Gradient method
  - System of nonlinear equations

3. Interpolation and regression analysis.

4. Numerical Differentiation.

5. Numerical Integration.

- Newton cotes formulas
- Romberg Integration
- Adaptive Quadrature
- Gaussian Quadrature

## 6. Solution of differential equation.

- Laplace equation
- Poisson equation
- One dimensional heat equation
- One dimensional wave equation

## 7. Solution of matrix problems.

## 8. Solution of boundary value problem.



# Numerical Methods Vs Numerical Analysis

Numerical methods is a special type of method that is used to obtain an approximate solution to a mathematical problem, While a numerical analysis is the application of an appropriate numerical method to physical problem in a systematic manner to arrive at a solution and to make interpretation of the said solution with the help of the said solution with the help of the various fast and efficient computing devices like, algorithms, programs, and computers etc.

# THANK YOU

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