



**D. Y. Patil College of Engineering & Technology**  
**Kasaba Bawada, Kolhapur 416006**  
**(An Autonomous Institute)**

**Academic Year:** 2023-24

**Semester:** II

**Class:** F.Y.B.Tech.

**Course:** Differential Equations and Numerical Techniques

**Course Code:** 231FYL111

**Tutorial-VIII**

**Numerical Solutions of Algebraic and Transcendental Equations-II**  
**(Regula-Falsi Method and Secant Method)**

<b>Course Outcomes (COs):</b> After successfully completion of this tutorial, the students will be able to:		
111.4	Apply the numerical techniques to solve algebraic and transcendental equations.	

  

Q.1	Using Regula-Falsi method, find approximate root of $x^2 - 2x - 1 = 0$ in the interval (2,3). Perform three iterations only.
Q.2	Using Regula-Falsi method, find approximate root of $x^3 + 2x^2 - 8 = 0$ in the interval (1,2). Perform three iterations only.
Q.3	Using Regula-Falsi method, find approximate root of $x^2 - \log x - 12 = 0$ in the interval (3,4). Perform three iterations only.
Q.4	Find the approximate root of $x^3 - 4x + 1 = 0$ using Secant method in the interval (1,2). Carry out three iterations only.
Q.5	Find the approximate root of $x^3 - x - 1 = 0$ using Secant method in the interval (1,2). Carry out three iterations only.
Q.6	Find the approximate value of $\sqrt[3]{100}$ in the interval (4,5) using Secant method. Perform three iterations only.



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**Tutorial-IX**

**Numerical Differentiation-I**

**(Newton's Forward Difference Formula and Newton's Backward Difference Formula)**

**Course Outcomes (COs):** After successfully completion of this tutorial, the students will be able to:

111.5 **Calculate** the derivative using interpolation formulae.

Q.1	Calculate the first and second derivatives of the function tabulated below at the point $x = 1.5$ and at $x = 2$ $x:$ 1.5 2.0 2.5 3.0 3.5 4.0 4.5 $f(x):$ 3.375 7.000 13.625 24.000 38.875 59.000 85.125
Q.2	Calculate the first and second derivatives of the function tabulated below at the point $x = 1.4$ . $x:$ 1.0 1.4 1.8 2.2 2.6 3.0 $y:$ 1.3 1.7512 5.7992 17.2072 40.9672 83.3000
Q.3	Calculate the first and second derivatives of the function tabulated below at the point $x = 3$ $x:$ 2.0 2.2 2.4 2.6 2.8 3.0 $f(x):$ -23.000 -21.952 -20.376 -18.224 -15.448 -12.000
Q.4	Calculate the first and second derivatives of the function tabulated below at the point $x = 2.6$ and $x = 2.8$ $x:$ 2.0 2.2 2.4 2.6 2.8 $f(x):$ 2.000 5.576 9.968 15.272 21.584
Q.5	Calculate the first and second derivative of the function tabulated below at the point $x = 4$ and $x = 9$ $x:$ 3 4 5 6 7 8 9 $f(x):$ 4.8 8.4 14.5 23.6 36.2 52.8 73.9



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**Tutorial-X**

**Numerical Differentiation-II**

**(Stirling's Central Difference Formula and Lagrange's Interpolation Formula)**

**Course Outcomes (COs):** After successfully completion of this tutorial, the students will be able to:

111.5 **Calculate** the derivative using interpolation formulae.

Q.1	From the following table, calculate $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 0$ $x:$ -3      -2      -1      0      1      2      3 $y:$ 0      0.0875      0.1763      0.2679      0.3640      0.4663      0.5774
Q.2	From the following table, calculate $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.15$ $x:$ 1.00      1.05      1.10      1.15      1.20      1.25      1.30 $y:$ 1.0000      1.0247      1.0488      1.0723      1.0954      1.1180      1.1401
Q.3	Calculate the first and second derivative of the function tabulated below at the point $x = 6$ $x$ : 3      4      5      6      7      8      9 $f(x):$ 4.8      8.4      14.5      23.6      36.2      52.8      73.9
Q.4	Using Lagrange's formula of interpolation compute $y(9.5)$ given $x:$ 7      8      9      10 $y:$ 3      1      1      9
Q.5	Using Lagrange's formula of interpolation compute $y(2)$ given $x:$ 0      1      3      4 $y:$ 5      6      50      105
Q.6	Find the polynomial $f(x)$ by using Lagrange's interpolation formula and hence find $f(2)$ and $f'(3)$ $x$ : -2      1      3      7 $f(x):$ 5      7      11      34