Bahria University,

Karachi Campus



LAB EXPERIMENT NO.

**4**

LIST OF TASKS

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| TASK NO | OBJECTIVE |
| **1** | **Write a python program for solving the following non-linear equations using Newton-Raphson method correct up to 5 decimal places:**  **a. cosx = xex (having initial guess x0 = 1)**  **b. x−2sinx−3 = 0 (having initial guess x0 = 4)** |
| 2 | Write a python program for solving the following non-linear equations using fixed point iterative method correct up to 3 decimal places:  a. cos x = 3x – 1  b. 2x3 – 7x2 – 6x + 1 = 0 |

Submitted On:

**Date: 26/10/2023**

**Task No. 01:**

**Write a python program for solving the following non-linear equations using Newton-Raphson method correct up to 5 decimal places:**

**a. cosx = xex (having initial guess x0 = 1)**

**b. x−2sinx−3 = 0 (having initial guess x0 = 4)**

**Solution and Output:**

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| **A** | **B** |
| import sympy as sp  x = sp.symbols('x')  user\_input = input("Enter the equation: ")  expression = sp.sympify(user\_input)  derivative = sp.diff(expression, x)  print('Darevative: ',derivative)  fun = sp.lambdify(x, expression, 'numpy')  differential = sp.lambdify(x, derivative, 'numpy')  def newton\_raphson\_method(x0):  prev\_x = float('inf')  while x0 != prev\_x:  prev\_x = x0  x0 = x0 - (fun(x0) / differential(x0))  print('approx root:', x0)  initial\_guess = float(input("Enter the initial guess: "))  newton\_raphson\_method(initial\_guess) | import sympy as sp  x = sp.symbols('x')  user\_input = input("Enter the equation: ")  expression = sp.sympify(user\_input)  derivative = sp.diff(expression, x)  print('Darevative: ',derivative)  fun = sp.lambdify(x, expression, 'numpy')  differential = sp.lambdify(x, derivative, 'numpy')  def newton\_raphson\_method(x0):  prev\_x = float('inf')  while x0 != prev\_x:  prev\_x = x0  x0 = x0 - (fun(x0) / differential(x0))  print('approx root:', x0)  initial\_guess = float(input("Enter the initial guess: "))  newton\_raphson\_method(initial\_guess) |
| **Output** | |
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**Task No. 02:**

**Write a python program for solving the following non-linear equations using fixed point iterative method correct up to 3 decimal places:**

**a. cos x = 3x – 1**

**b. 2x3 – 7x2 – 6x + 1 = 0**

**Solution and Output:**

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| **Task A** | **Task B** |
| import math  def f(x):  return math.cos(x)-3\*x+1  def g(x):  return (math.cos(x)+1)/3  def fixed\_point\_iterative\_method(x0,iterations):  step=1  x1=g(x0)  while(step<iterations):  x0=x1  x1=g(x0)  step+=1  print(f'approx root: {x1:.3f}')  x0=1.0  iterations=50  fixed\_point\_iterative\_method(x0,iterations) | import math  def f(x):  return 2\*x\*\*3-7\*x\*\*2-6\*x+1  def g(x):  return ((7\*x\*\*2+6\*x-1)/2)\*\*(1/3)  def fixed\_point\_iterative\_method(x0,iterations):  step=1  x1=g(x0)  while(step<iterations):  x0=x1  x1=g(x0)  step+=1  print(f'approx root: {x1:.3f}')  x0=1.0  iterations=50  fixed\_point\_iterative\_method(x0,iterations) |
| **Output** | |
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