

EASTERN MEDITERRANEAN UNIVERSITY

DEPARTMENT OF MATHEMATICS

MATH 373 – NUMERICAL ANALYSIS ENGINEERS

LAB QUIZ1-A

| QUESTION 1 | QUESTION 2 | QUESTION 3 | TOTAL |
|------------|------------|------------|-------|
| 14 | 18 | 18 | 50 |

1) (14 p) Consider the function

$$f(x) = \sin(x) - 3x + 6$$

Use **Secant Method** and **Bisection Method** to find the roots of the given function. Start with $(a, b) = (1, 3)$ and $(p_0, p_1) = (2, 3)$.

a) Write the function in **MATLAB** language (3)

$$y = \sin(x) - 3 * x + 6;$$

b) Write the derivative of the function in **MATLAB** language (3)

$$dy = \cos(x) - 3;$$

c) How many iterations did **Secant Method** obtained? 5 or 6 (1.5) What is the root with this method? 2.2577311604 (1.5)

d) How many iterations did **Bisection Method** obtained? 17 or 18 (1.5) What is the root with this method? 2.2577285767 (1.5)

e) Which method is the best? **Secant Method** ; Why is the best? **Less iteration** (2)

- 2) (18 p) Use the user-friendly program developed for the **Fixed Point** and **Newton-Raphson** method to determine the roots of the simultaneous nonlinear equation. Employ initial guesses of $(x_0, y_0) = (0.6, 0.6)$.

$$F(x, y) = 5x - y + 4$$

$$G(x, y) = 3x^2 - 2y - 5$$

- a) Write the function in MATLAB language (5)

$$f1 = 5 * x1 - x2 + 4;$$

$$f2 = 3 * x1^2 - 2 * x2 - 5;$$

- b) Write the derivatives of the functions in MATLAB language (5)

$$f1x = 5;$$

$$f1y = -1;$$

$$f2x = 6 * x1;$$

$$f2y = -2;$$

- c) How many iterations did **Fixed Point System** obtain? 10 (2)
and does it converge? No (2)

- d) How many iterations did **Newton Method** obtain? 5 (2)
and does it converge? Yes (2)

3) (18 p) Use **Jacobi and Gauss-Seidel iterations** to find x_k . Start with $x_0 = (0,0,0)$.

$$-2x + 3y + 6z = 4$$

$$4x + y - z = 11$$

$$-x + 5y - 2z = 6$$

| | | |
|----|---|----|
| 4 | 1 | -1 |
| -1 | 5 | -2 |
| -2 | 3 | 6 |

$$A = [4, 1, -1; -1, 5, -2; -2, 3, 6]$$

$$b = [11; 6; 4]$$

$$x_0 = [0; 0; 0]$$

a) How many iteration did **Jacobi Method** obtained? **11 (2.5)**
and does it converges? **Yes (2.5)**

b) How many iteration did **Gauss-Seidel** obtained? **5 (2.5)**
and does it converges? **Yes (2.5)**

c) Which method is the best? **Gauss-Seidel (2.5)**
Why is the best? **Less iteration (2.5)**

d) Solve the above system of linear equation using **LU decomposition**. What value did you obtained?

$$x = 2.4082 \text{ (1)}$$

$$y = 1.8912 \text{ (1)}$$

$$z = 0.5238 \text{ (1)}$$