Practicum Case	
MATH6183 | MATH6183001 | MATH6183016 | MATH6183049 Scientific Computing	
Mathematics & Statistics	**E231-MATH6183-JJ01-04**
Valid on *Even Semester Year 2023/2024*	**Revision 00**

Learning Outcomes

- LO3 – evaluate the application of taylor series and root of equations in scientific computation

Topic

- Session 04 – Root of Equations

Sub Topics

- Newton-Raphson Method
- Bisection Method

Soal

Case

1. Newton Raphson

Find the **root of the equation** from the equation f(x) below by using **Newton Raphson** method:

$$f(x) : x^6 + 2x^2 - 3$$

- How many **iterations** are required to find the root of the equation?
- With **first guess** of the value is **4**.
- With **tolerate error** is **0.01**.
- With the number of the **max iterations** is **15**.
- **Print the result** of the **root** in **each iteration**. If the iteration is **over the max** iterations the **print error message**.

```
Iteration of 1. new root = 3.340746753246753
Iteration of 2. new root = 2.797007638983917
Iteration of 3. new root = 2.3538214106022255
Iteration of 4. new root = 2.001646082945381
Iteration of 5. new root = 1.7361876455432952
Iteration of 6. new root = 1.55546969508684
Iteration of 7. new root = 1.4515431881364969
Iteration of 8. new root = 1.4034280089690414
Iteration of 9. new root = 1.3850995877591445
Iteration of 10. new root = 1.3788906841001125
Iteration of 11. new root = 1.3768909874214335
Iteration of 12. new root = 1.3762583968076516
the root of equation is: 1.3762583968076516
```

Figure 1. Newton Raphson Result with Tolerate Error 0.01

2. Bisection

Find the **root of the equation** from the equation f(x) below by using **Bisection** method:

$$f(x) : 10x^3 + 8x^2 + 9$$

With the following **coordinates x1** and **x2** are:

a. x1 = 3, x2 = 4

b. x1 = -10, x2 = 17

c. x1 = 10, x2 = -15

d. x1 = -2, x2 = 4

e. x1 = 12, x2 = -5

f. x1 = -8, x2 = -13

g. x1 = 7, x2 = -21

```
coordinates = [
    [3, 4],
    [-10, 17],
    [10, -15],
    [-2, 4],
    [12, -5],
    [-8, -13],
    [7, -21],
]
```

- Find the **root of each coordinate**.
- **Print** the **result of the root** in each iteration of coordinates.
- With **tolerate error** is **0.001**.
- For each iteration of coordinates, **validate** coordinate **x1 and x2** must **not be the same sign**.

```
a = 3 and b = 4 not bound a root
root of the function = -1.3180370330810547 with coordinates of x1 = -10 and x2 = 17
root of the function = -1.318063735961914 with coordinates of x1 = 10 and x2 = -15
root of the function = -1.318023681640625 with coordinates of x1 = -2 and x2 = 4
root of the function = -1.318084716796875 with coordinates of x1 = 12 and x2 = -5
a = -8 and b = -13 not bound a root
root of the function = -1.31805419921875 with coordinates of x1 = 7 and x2 = -21
```

Figure 2. Root of the Equation of Each Coordinate with Bisection