

TUGAS I
ANALISA TEKNIK II



METODE NUMERIK

ROCHMAD WINARSO, ST
NIM : L4E008014

MAGISTER TEKNIK MESIN
UNIVERSITAS DIPONEGORO SEMARANG
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1-7 Apply fixed point iteration and answer related questions where indicated. Show detail of your work.

4. $f = x^4 - x + 0,2 = 0$, the root near 1, $x_0 = 1$

$$x^4 - x = -0,2$$

$$(x^3 - 1)x = -0.2$$

$$x = g_1(x) = \frac{-0.2}{(x^3 - 1)} \quad \text{sehingga} \quad x_{n+1} = \frac{-0.2}{(x_n^3 - 1)}$$

kemudian diselesaikan dengan menggunakan tabel berikut :

n	xn	x(n+1)
0	1,1	-0,604230
1	-0,604230	0,163854
2	0,163854	0,200884
3	0,200884	0,201635
4	0,201635	0,201653
5	0,201653	0,201654
6	0,201654	0,201654
7	0,201654	0,201654
8	0,201654	0,201654
9	0,201654	0,201654
10	0,201654	0,201654

Pada tabel diatas terlihat bahwa pada iterasi ke 5 hasil sudah konvergen dengan hasil **0,201654**

7. (Bessel fungtions, drumhead) A partial sum of Maclaurin series of $J_0(x)$ is

$$f(x) = 1 - \frac{1}{4}x^2 + \frac{1}{64}x^4 - \frac{1}{2304}x^6$$

$$\frac{1}{4}x^2 = 1 + \frac{1}{64}x^4 - \frac{1}{2304}x^6$$

$$x = \frac{4}{x} + \frac{1}{16}x^3 - \frac{1}{576}x^5$$

$$x_{n+1} = \frac{4}{x_n} + \frac{1}{16}x_n^3 - \frac{1}{576}x_n^5$$

kemudian diselesaikan dengan menggunakan tabel berikut :

n	x _n	x _(n+1)
0	2	2,444444
1	2,444444	2,397735
2	2,397735	2,392208
3	2,392208	2,391697
4	2,391697	2,391651
5	2,391651	2,391647
6	2,391647	2,391647
7	2,391647	2,391647
8	2,391647	2,391647
9	2,391647	2,391647
10	2,391647	2,391647

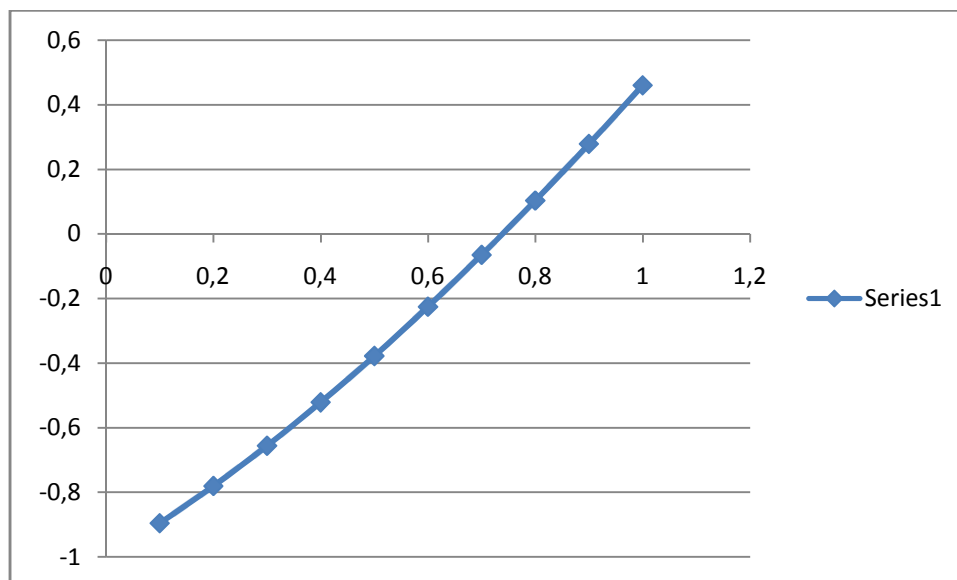
Pada tabel diatas terlihat bahwa pada iterasi ke 5 hasil sudah konvergen dengan hasil **2,391697**

9-18 Apply Newtons Method (6D accuracy) .

First sketch the fungtion to see what is going on.

10. $x = \cos x$, $x_0 = 1$

$$f(x) = x - \cos x$$



$$f(x) = x - \cos x$$

$$f'(x) = 1 + \sin x$$

$$x_{n-1} = x_n - \frac{f(x)}{f'(x)}$$

$$x_{n-1} = x_n - \frac{x_n - \cos x_n}{1 + \sin x_n}$$

$$x_{n-1} = \frac{x_n(1 + \sin x_n)}{1 + \sin x_n} - \frac{(x_n - \cos x_n)}{1 + \sin x_n}$$

$$x_{n-1} = \frac{x_n + x_n \sin x_n}{1 + \sin x_n} - \frac{(x_n - \cos x_n)}{1 + \sin x_n}$$

$$x_{n-1} = \frac{\cos x_n + x_n \sin x_n}{1 + \sin x_n}$$

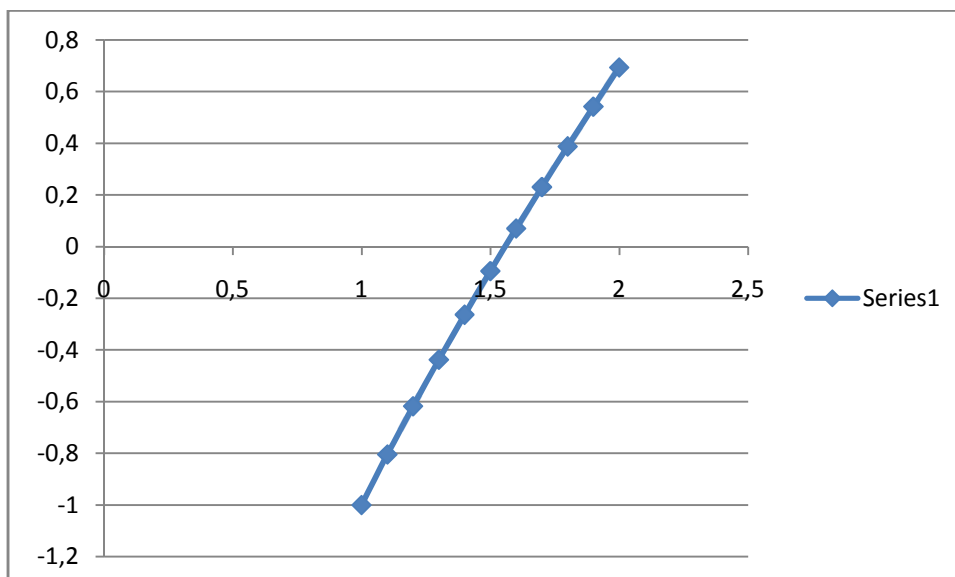
kemudian diselesaikan dengan menggunakan tabel berikut :

n	xn	Nn	Dn	x(n+1)
0	1	1,381773	1,841471	0,750364
1	0,750364	1,243118	1,681905	0,739113
2	0,739113	1,236957	1,673633	0,739085
3	0,739085	1,236942	1,673612	0,739085
4	0,739085	1,236942	1,673612	0,739085
5	0,739085	1,236942	1,673612	0,739085
6	0,739085	1,236942	1,673612	0,739085
7	0,739085	1,236942	1,673612	0,739085
8	0,739085	1,236942	1,673612	0,739085
9	0,739085	1,236942	1,673612	0,739085
10	0,739085	1,236942	1,673612	0,739085

Pada tabel diatas terlihat bahwa pada iterasi ke 5 hasil sudah konvergen dengan hasil **0,730085**

12. $x + \ln x = 2, x_0 = 2$

$$f(x) = x + \ln x - 2$$



$$f(x) = x + \ln x - 2$$

$$f'(x) = 1 + \frac{1}{x}$$

$$x_{n-1} = x_n - \frac{f(x)}{f'(x)}$$

$$x_{n-1} = x_n - \frac{x_n + \ln x_n - 2}{1 + \frac{1}{x_n}}$$

$$x_{n-1} = \frac{x_n(1 + \frac{1}{x_n})}{1 + \frac{1}{x_n}} - \frac{x_n + \ln x_n - 2}{1 + \frac{1}{x_n}}$$

$$x_{n-1} = \frac{x_n(1 + \frac{1}{x_n})}{1 + \frac{1}{x_n}} - \frac{x_n + \ln x_n - 2}{1 + \frac{1}{x_n}}$$

$$x_{n-1} = \frac{(x_n + 1) - x_n - \ln x_n + 2}{1 + \frac{1}{x_n}}$$

$$x_{n-1} = \frac{-\ln x_n + 3}{1 + \frac{1}{x_n}}$$

kemudian diselesaikan dengan menggunakan tabel berikut :

n	xn	Nn	Dn	x(n+1)
0	2	2,306853	1,500000	1,537902
1	1,537902	2,569581	1,650237	1,557099
2	1,557099	2,557176	1,642220	1,557146
3	1,557146	2,557146	1,642201	1,557146
4	1,557146	2,557146	1,642201	1,557146
5	1,557146	2,557146	1,642201	1,557146
6	1,557146	2,557146	1,642201	1,557146
7	1,557146	2,557146	1,642201	1,557146
8	1,557146	2,557146	1,642201	1,557146
9	1,557146	2,557146	1,642201	1,557146
10	1,557146	2,557146	1,642201	1,557146

Pada tabel diatas terlihat bahwa pada iterasi ke 3 hasil sudah konvergen dengan hasil **1,557146**