-1.791

Assignment-11

1. Find the root of the following eqn using the bisection method.

a. $F(x) = \sin(x) - 3\cos(0.5x)$

$x = 1,\ f(1) = \sin(1) - 3\cos(0.5 \times 1) = -1.791$

$x = 4,\ f(4) = \sin(4) - 3\cos(0.5 \times 4) = 0.492$

Iteration	x_a	$f(a)$	x_b	$f(b)$	x_c	$F(c)$	Error = $\frac{F(c) - F(a)}{F(c)}$
1	1	-1.791	4	0.492	2.500	-0.347	0.600
2	2.5	-0.347	4	0.492	3.250	0.054	0.231
3	3.5	-0.347	0.054	-2.945	1.277	-1.452	0.958
4	1.277	-1.452	0.054	-2.945	0.666	-2.218	0.919
5	0.666	-2.217	0.054	-2.945	0.360	-2.599	0.850
6	0.360	-2.599	0.054	-2.945	0.207	-2.778	0.739
7	0.207	-2.778	0.054	-2.945	0.131	-2.863	0.586
8	0.131	-2.863	0.054	-2.945	0.093	-2.904	0.416
9	0.093	-2.904	0.054	-2.945	0.074	-2.925	0.265
10	0.074	-2.924	0.054	-2.945	0.064	-2.935	0.156
11	0.064	-2.935	0.054	-2.945	0.059	-2.940	0.085
12	0.059	-2.940	0.054	-2.945	0.057	-2.942	0.044
13	0.057	-2.942	0.054	-2.945	0.056	-2.943	0.027
14	0.056	-2.942	0.054	-2.945	0.055	-2.944	0.018
15	0.055	-2.940	0.054	-2.945	0.055	-2.944	0.009

here, error > 0.01

0.009 //

~~Assig~~

b. $f(x) = \cos(x) - 3\sin(0.5x)$

Iteration	X_a	$f(a)$	X_b	$f(b)$	X_c	$f(c)$	Error
1	1	-0.8950	6	0.5368	3.5000	-3.8884	0.7143
2	3.5000	-3.8884	6	0.5368	4.7500	-2.0435	0.2632
3	4.7500	-2.0435	6	0.5368	5.3750	-0.7608	0.1163
4	5.3750	-0.7608	6	0.5368	5.6875	-0.0526	0.0549
5	5.6875	-0.0526	6	0.5368	5.8438	0.2511	0.0267
6.	5.6875	-0.0526	5.8438	0.2512	5.7657	0.1014	0.0136
7	5.6875	-0.0526	5.7657	0.1015	5.7266	0.0249	0.0068

c. $f(x) = \ln(x) + 5x^2 - 6$

$f(1) = -1.0000 < 0$

$f(2) = 14.69315 > 0$

Iteration	x_a	$f(a)$	x_b	$f(b)$	x_c	$f(c)$	Error
1	1	-1.000	2	14.69	1.500	5.655	0.333
2	~~1.501~~	-1.000	1.500	5.655	1.250	2.035	0.200
3	1	-1.000	1.250	2.035	1.125	0.445	0.111
4	1	-1.000	1.125	0.445	1.062	-0.294	0.058
5	1.062	-0.300	1.125	-8.001	0.593	-4.760	0.78
6	0.593	-4.764	1.125	0.445	0.859	-2.462	0.309
7	0.859	-2.462	1.125	0.445	0.992	-1.087	0.134
8	0.992	-1.0877	1.125	0.445	1.058	-0.341	0.062
9	1.058	-0.346	1.125	0.445	1.091 ~~0.044~~	0.044	0.030
10	1.058	-0.346	1.091	0.038	1.074	-0.155	0.015
11	1.074	-0.161	1.091	0.038	1.082	-0.061	0.007

here $0.007 \leq 0.01$

2. find the root of the following equation using the method of Newton Raphson

a. $f(x) = \sin x - \cos(0.5x) + \ln(x)$

$f'(x) = \cos x + \sin(0.5x) + \frac{1}{x}$

iteration	x_n	$f(x)$	$f'(x)$	x_{n+1}	Error
1	1	-0.0361	2.0197	1.0179	0.0176
2	1.0179	-0.0045	1.998	1.0202	0.0022

2.

C.

Soln:-

$f(x) = \ln(x) + e^x - 3x$

$f'(x) = \frac{1}{x} + e^x - 3$

Iteration	x_n	$f(x)$	$f'(x)$	x_{n+1}	Error
1	1	-0.2817	0.7183	1.3922	0.2817
2	1.3922	0.1780	1.7420	1.2900	0.0792
3	1.2900	0.0174	1.4080	1.2776	0.0092

pxolo parlab

3. False position method.

$$f(x) = 5x^3 - \cos(2x)$$

iteration	x_n	$f(x_n)$	X_1	$f(X_1)$	X_c	$f(X_c)$	error
1	2	40.6536	0	-1.0000	0.0480	-0.9948	
2	2	40.65	0.0480	-0.995	0.095	0.9978	20.13
3	2	40.6536	0.0958	-0.978	0.140	0.0948	0.321
4	2	40.6536	0.140	-0.947	0.182	-0.904	0.237
5	2	40.6536	0.984	-0.904	0.222	-0849	
6	2	40.6536	0.222	0848	0.258	-0.783	0.139
7	2	40.6536	0.258	-0.784	0.291	-0.712	0.11
8	2	40.6536	0.291	-0.712	0.320	-0.6370	0.0
9	2	40.6536	0.320	-0.638	0.346	0.563	

0.057

6. $f(x) = \ln(x) + e^x - 3x^2$

Iteration	X_u	$f(X_u)$	X_l	$f(X_l)$	X_m	$f(X_m)$	error
~~1~~	~~-0.2817~~	~~4~~	~~7.9844~~				
1	1	-0.2817	4	7.9844	1.1022	-0.5366	
~~1.1022~~	~~0.5~~	~~4~~					
2	1.1022	-0.5364	4	7.9844	1.2846	-1.0870	
3	1.2846	-1.0869	4	7.9844	1.6100	-2.2971	
4	1.6100	-2.2973	4	7.9844	2.1440	-4.4940	
5	2.1440	-4.4940	4	7.9844	2.8124	-6.0449	
6	2.8124	-6.0449	4	7.9844	3.3241	-4.1737	
7	3.3241	-4.1737	4	7.9844	3.5561	-1.6422	
8	3.3561	-3.9023	4	7.9844	3.5675	-1.4814	
9	3.5675	-1.4814	4	7.9844	3.6352	-0.4439	
10	3.6352	-0.4439	4	7.9844	3.6544	-0.1237	

$$\text{Error} = \left| \frac{3.6544 - 3.6352}{3.6544} \right|$$

$$= 0.0052 < 0.01$$