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CS 323 HW2

PROBLEM 1

1) X 1=

0.0933
0.3841
-1.2857
0.0580
0.0493
0.0382
0.2905
-0.4883
0.5828

```
X1 =

    0.0933
    0.3841
   -1.2857
    0.0580
    0.0493
    0.0382
    0.2905
   -0.4883
    0.5828
```

2) L =

1.0000	0	0	0	0	0	0	0	0
0.8095	1.0000	0	0	0	0	0	0	0
1.9524	1.6514	1.0000	0	0	0	0	0	0
0.5714	0.3048	0.2247	1.0000	0	0	0	0	0
0.6667	0.5996	0.4910	1.0246	1.0000	0	0	0	0
0.0952	-0.2072	-0.3371	0.0046	-1.1718	1.0000	0	0	0
0.5238	0.4084	-0.3430	-1.6101	-2.9945	1.6818	1.0000	0	0
1.0952	1.4243	0.6327	2.2333	-1.4168	-1.2830	-0.7508	1.0000	0
1.4762	1.7669	0.3145	-1.7193	-3.5746	1.6217	1.8093	0.3741	1.0000

U =

21.0000	32.0000	14.0000	8.0000	6.0000	9.0000	11.0000	3.0000	5.0000
0	-23.9048	-3.3333	7.5238	50.1429	15.7143	10.0952	-1.4286	1.9524
0	0	-8.8287	-23.0438	-83.5199	-21.5219	-12.1474	3.5020	-3.9861
0	0	0	6.3141	3.0582	9.9043	0.3673	22.9341	16.4436
0	0	0	0	14.8070	7.9966	0.2013	-19.3608	-10.3948
0	0	0	0	0	17.4688	20.1832	-11.1936	3.3285
0	0	0	0	0	0	-20.8012	10.9883	1.9667
0	0	0	0	0	0	0	-84.2266	-35.4390
0	0	0	0	0	0	0	0	-3.1609

```
L =

    1.0000         0         0         0         0         0         0         0         0
    0.8095    1.0000         0         0         0         0         0         0         0
    1.9524    1.6514    1.0000         0         0         0         0         0         0
    0.5714    0.3048    0.2247    1.0000         0         0         0         0         0
    0.6667    0.5996    0.4910    1.0246    1.0000         0         0         0         0
    0.0952   -0.2072   -0.3371    0.0046   -1.1718    1.0000         0         0         0
    0.5238    0.4084   -0.3430   -1.6101   -2.9945    1.6818    1.0000         0         0
    1.0952    1.4243    0.6327    2.2333   -1.4168   -1.2830   -0.7508    1.0000         0
    1.4762    1.7669    0.3145   -1.7193   -3.5746    1.6217    1.8093    0.3741    1.0000
```

```
U =

   21.0000   32.0000   14.0000    8.0000    6.0000    9.0000   11.0000    3.0000    5.0000
         0  -23.9048   -3.3333    7.5238   50.1429   15.7143   10.0952   -1.4286    1.9524
         0         0   -8.8287  -23.0438  -83.5199  -21.5219  -12.1474    3.5020   -3.9861
         0         0         0    6.3141    3.0582    9.9043    0.3673   22.9341   16.4436
         0         0         0         0   14.8070    7.9966    0.2013  -19.3608  -10.3948
         0         0         0    0.0000         0   17.4688   20.1832  -11.1936    3.3285
         0         0         0   -0.0000         0         0  -20.8012   10.9883    1.9667
   -0.0000         0         0    0.0000         0         0    0.0000  -84.2266  -35.4390
    0.0000         0         0    0.0000         0         0   -0.0000         0   -3.1609
```

```
X =

    0.0933
    0.3841
   -1.2857
    0.0580
    0.0493
    0.0382
    0.2905
   -0.4883
    0.5828
```

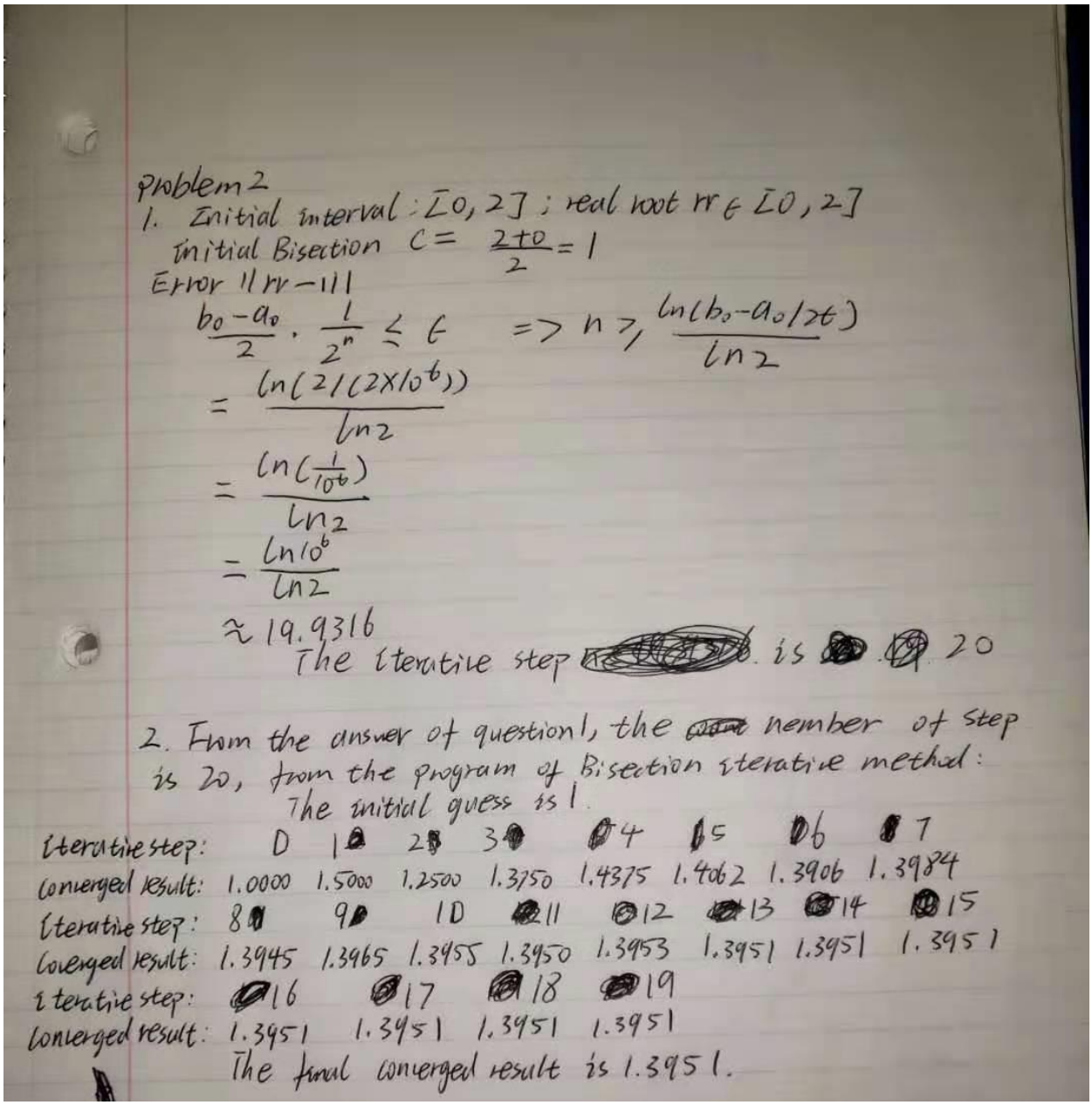
```
X =

    0.0933
    0.3841
   -1.2857
    0.0580
    0.0493
    0.0382
    0.2905
   -0.4883
    0.5828
```

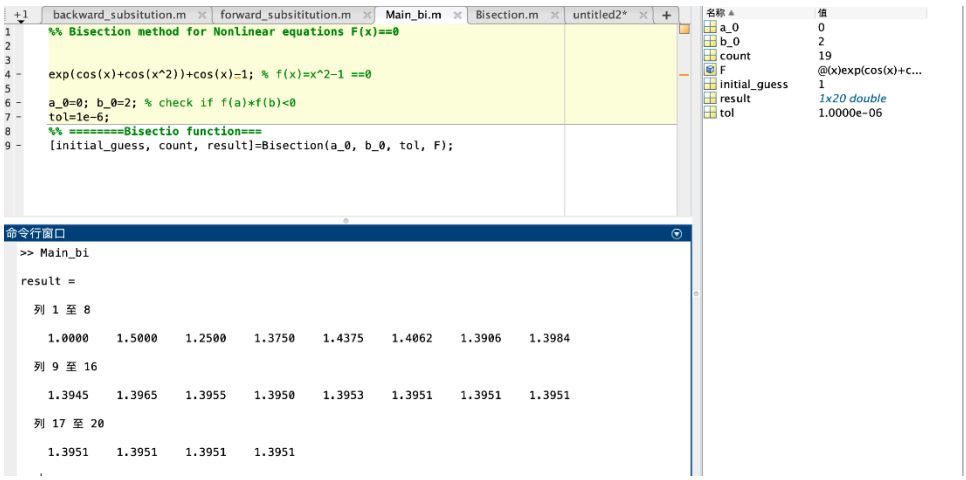
3) RelativeError = 5.6412e-16 ≈0

```
>> RelativeError = abs(norm(X1)-norm(X))/abs(norm(X1))

RelativeError =

   5.6412e-16
```

Problem 2

1)&2)


problem 2
1. Initial interval : [0, 2] ; real root rr ∈ [0, 2]
Initial Bisection c = (2+0)/2 = 1
Error ||rr − 111
(b0 − a0) · 1/2^n ≤ ε => n ≥ ln(b0 − a0/2ε) / ln 2
= ln(2/(2×10^6)) / ln 2
= ln(1/10^6) / ln 2
= ln 10^6 / ln 2
≈ 19.9316
The iterative step is 20
2. From the answer of question1, the number of step is 20, from the program of Bisection iterative method:
The initial guess is 1.
Iterative step: 0 1 2 3 4 5 6 7
Converged result: 1.0000 1.5000 1.2500 1.3750 1.4375 1.4062 1.3906 1.3984
Iterative step: 8 9 10 11 12 13 14 15
Coverged result: 1.3945 1.3965 1.3955 1.3950 1.3953 1.3951 1.3951 1.3951
Iterative step: 16 17 18 19
Converged result: 1.3951 1.3951 1.3951 1.3951
The final converged result is 1.3951.


backward_subsitution.m
forward_subsititution.m
Main_bi.m
Bisection.m
untitled2*
%% Bisection method for Nonlinear equations F(x)==0
exp(cos(x)+cos(x^2))+cos(x)-1; % f(x)=x^2-1 ==0
a_0=0; b_0=2; % check if f(a)*f(b)<0
tol=1e-6;
%% ========Bisectio function===
[initial_guess, count, result]=Bisection(a_0, b_0, tol, F);
命令行窗口
>> Main_bi
result =
列 1 至 8
1.0000 1.5000 1.2500 1.3750 1.4375 1.4062 1.3906 1.3984
列 9 至 16
1.3945 1.3965 1.3955 1.3950 1.3953 1.3951 1.3951 1.3951
列 17 至 20
1.3951 1.3951 1.3951 1.3951
名称 值
a_0 0
b_0 2
count 19
F @(x)exp(cos(x)+c...
initial_guess 1
result 1x20 double
tol 1.0000e-06

3)the points and the graph in matlab