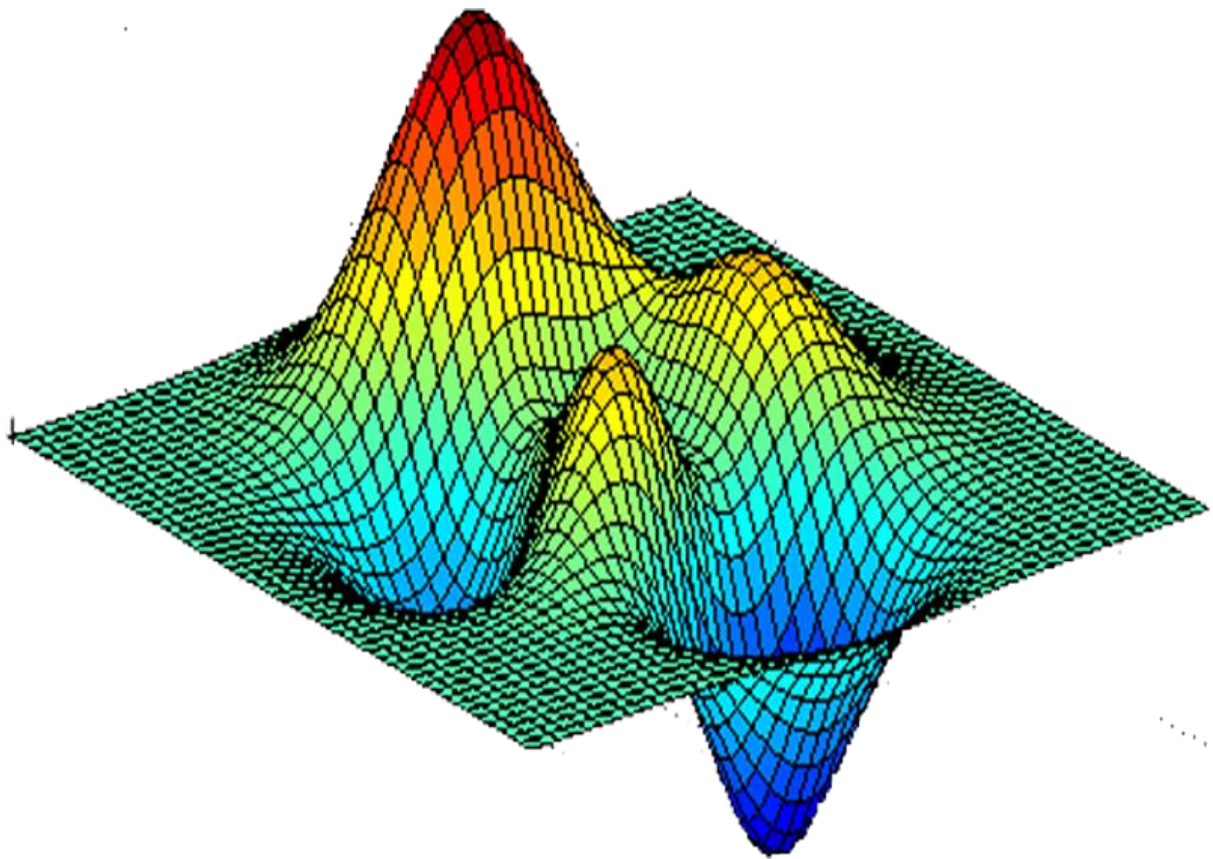# Numerical Computing.

Fixed point iteration

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Tasks

Task 1: Fixed Point Iteration

Code:

```c
1.  //Qasid Ahmed Aleem
2.  //fixed Iteration Method
3.  //29-5-18
4.
5.  #include<stdio.h>
6.  #include<math.h>
7.
8.  double eqtn_1(double f);
9.  double eqtn_2(double f);
10. double eqtn_3(double f);
11.
12. int main()
13. {
14.     double x1=1.5,x2=1.5,x3=1.5,x_new1=0,
15.     x_new2=0,x_new3=0;
16.     int i,d;
17.     puts("how many iterations ?");
18.     scanf("%d",&d);
19.     printf("\tCounter\t\tg1(x)\t\tg2(x)\t\t\tg3(x)\n");
20.     for (i=0;i<d;i+=1)
21.     {
22.     x_new1=eqtn_1(x1);
23.     x_new2=eqtn_2(x2);
24.     x_new3=eqtn_3(x3);
25.
26.     printf("\t%02d\t|%+.16f  | %.16f| %.16f|\t\n",i+1,eqtn_1(x1),eqtn_2(x2),eqtn_3(
    x3));
27.     x1=x_new1;
28.     x2=x_new2;
29.     x3=x_new3;
30.     }
31. printf("the approximate roots of g1(x),g2(x), and g3(x) are \n%.16f \n%+.16f \n%+.1
    6f \nrespectively",
32. x1,x2,x3);
33. return 0;
34. }
35. double eqtn_1(double f)
36. {
37.     double y=((10/f)-4*f);
38.
39.     return pow(y,0.5); //x=(10/x - 4x)^1/2
40. }
41.
42.
43. double eqtn_2(double f)
44. {
45.     double y=10-pow(f,3);
46.     return 0.5* pow(y,0.5);//0.5(10 - x^3)^1/2
47. }
48.
49. double eqtn_3(double f)
50. {
51.     double y=10/(f+4);
52.     return pow(y,0.5); //x=( 10/(x+4) )^1.2
53. }
54.
```

Result:

```
how many iterations ?
52
        Counter         g1(x)                g2(x)                    g3(x)
        01          |+0.8164965809277263 | 1.2869537676233751| 1.3483997249264841|
        02          |+2.9969088057872200 | 1.4025408035395783| 1.3673763719912828|
        03          |-1.#IND000000000000 | 1.3454583740232942| 1.3649570154024870|
        04          |-1.#IND000000000000 | 1.3751702528160383| 1.3652647481134421|
        05          |-1.#IND000000000000 | 1.3600941927617329| 1.3652255941605249|
        06          |-1.#IND000000000000 | 1.3678469675921328| 1.3652305756734338|
        07          |-1.#IND000000000000 | 1.3638870038840212| 1.3652299418781833|
        08          |-1.#IND000000000000 | 1.3659167333900399| 1.3652300225155685|
        09          |-1.#IND000000000000 | 1.3648782171936771| 1.3652300122561221|
        10          |-1.#IND000000000000 | 1.3654100611699569| 1.3652300135614253|
        11          |-1.#IND000000000000 | 1.3651378206692129| 1.3652300133953523|
        12          |-1.#IND000000000000 | 1.3652772085244786| 1.3652300134164816|
        13          |-1.#IND000000000000 | 1.3652058502970472| 1.3652300134137934|
        14          |-1.#IND000000000000 | 1.3652423837188388| 1.3652300134141355|
        15          |-1.#IND000000000000 | 1.3652236802252822| 1.3652300134140918|
        16          |-1.#IND000000000000 | 1.3652332557424998| 1.3652300134140976|
        17          |-1.#IND000000000000 | 1.3652283534626271| 1.3652300134140967|
        18          |-1.#IND000000000000 | 1.3652308632436367| 1.3652300134140969|
        19          |-1.#IND000000000000 | 1.3652295783339587| 1.3652300134140969|
        20          |-1.#IND000000000000 | 1.3652302361581812| 1.3652300134140969|
        21          |-1.#IND000000000000 | 1.3652298993777325| 1.3652300134140969|
        22          |-1.#IND000000000000 | 1.3652300717962909| 1.3652300134140969|
        23          |-1.#IND000000000000 | 1.3652299835246740| 1.3652300134140969|
        24          |-1.#IND000000000000 | 1.3652300287163228| 1.3652300134140969|
        25          |-1.#IND000000000000 | 1.3652300055799500| 1.3652300134140969|
        26          |-1.#IND000000000000 | 1.3652300174248766| 1.3652300134140969|
        27          |-1.#IND000000000000 | 1.3652300113607330| 1.3652300134140969|
        28          |-1.#IND000000000000 | 1.3652300144653395| 1.3652300134140969|
        29          |-1.#IND000000000000 | 1.3652300128759012| 1.3652300134140969|
        30          |-1.#IND000000000000 | 1.3652300136896320| 1.3652300134140969|
        31          |-1.#IND000000000000 | 1.3652300132730335| 1.3652300134140969|
        32          |-1.#IND000000000000 | 1.3652300134863158| 1.3652300134140969|
        33          |-1.#IND000000000000 | 1.3652300133771236| 1.3652300134140969|
        34          |-1.#IND000000000000 | 1.3652300134330257| 1.3652300134140969|
        35          |-1.#IND000000000000 | 1.3652300134044060| 1.3652300134140969|
        36          |-1.#IND000000000000 | 1.3652300134190583| 1.3652300134140969|
        37          |-1.#IND000000000000 | 1.3652300134115567| 1.3652300134140969|
        38          |-1.#IND000000000000 | 1.3652300134153972| 1.3652300134140969|
        39          |-1.#IND000000000000 | 1.3652300134134312| 1.3652300134140969|
        40          |-1.#IND000000000000 | 1.3652300134144377| 1.3652300134140969|
        41          |-1.#IND000000000000 | 1.3652300134139224| 1.3652300134140969|
        42          |-1.#IND000000000000 | 1.3652300134141861| 1.3652300134140969|
        43          |-1.#IND000000000000 | 1.3652300134140511| 1.3652300134140969|
        44          |-1.#IND000000000000 | 1.3652300134141202| 1.3652300134140969|
        45          |-1.#IND000000000000 | 1.3652300134140849| 1.3652300134140969|
        46          |-1.#IND000000000000 | 1.3652300134141029| 1.3652300134140969|
        47          |-1.#IND000000000000 | 1.3652300134140938| 1.3652300134140969|
        48          |-1.#IND000000000000 | 1.3652300134140984| 1.3652300134140969|
        49          |-1.#IND000000000000 | 1.3652300134140960| 1.3652300134140969|
        50          |-1.#IND000000000000 | 1.3652300134140973| 1.3652300134140969|
        51          |-1.#IND000000000000 | 1.3652300134140967| 1.3652300134140969|
        52          |-1.#IND000000000000 | 1.3652300134140969| 1.3652300134140969|
the approximate roots of g1(x),g2(x), and g3(x) are
-1.#IND000000000000
+1.3652300134140969
+1.3652300134140969
respectively
--------------------------------
```

Excel Work:

counter	$g_1(x)=(10/x - 4x)^{1/2}$	$g_2(x)=0.5(10-x^3)^{1/2}$	$g_3(x)=(10/x+4)^{1/2}$
0	1.5	1.5	1.5
1	0.81649658092772600	1.28695376762338000	1.34839972492648000
2	2.99690880578722000	1.40254080353958000	1.36737637199128000
3	#NUM!	1.34545837402329000	1.36495701540249000
4	#NUM!	1.37517025281604000	1.36526474811344000
5	#NUM!	1.36009419276173000	1.36522559416052000
6	#NUM!	1.36784696759213000	1.36523057567343000
7	#NUM!	1.36388700388402000	1.36522994187818000
8	#NUM!	1.36591673339004000	1.36523002251557000
9	#NUM!	1.36487821719368000	1.36523001225612000
10	#NUM!	1.36541006116996000	1.36523001356143000
11	#NUM!	1.36513782066921000	1.36523001339535000
12	#NUM!	1.36527720852448000	1.36523001341648000
13	#NUM!	1.36520585029705000	1.36523001341379000
14	#NUM!	1.36524238371884000	1.36523001341414000
15	#NUM!	1.36522368022528000	1.36523001341409000
16	#NUM!	1.36523325574250000	1.36523001341410000
17	#NUM!	1.36522835346263000	1.36523001341410000
18	#NUM!	1.36523086324364000	1.36523001341410000
19	#NUM!	1.36522957833396000	1.36523001341410000
20	#NUM!	1.36523023615818000	1.36523001341410000
21	#NUM!	1.36522989937773000	1.36523001341410000
22	#NUM!	1.36523007179629000	1.36523001341410000
23	#NUM!	1.36522998352467000	1.36523001341410000
24	#NUM!	1.36523002871632000	1.36523001341410000
25	#NUM!	1.36523000557995000	1.36523001341410000
26	#NUM!	1.36523001742488000	1.36523001341410000
27	#NUM!	1.36523001136073000	1.36523001341410000
28	#NUM!	1.36523001446534000	1.36523001341410000
29	#NUM!	1.36523001287590000	1.36523001341410000
30	#NUM!	1.36523001368963000	1.36523001341410000
31	#NUM!	1.36523001327303000	1.36523001341410000
32	#NUM!	1.36523001348632000	1.36523001341410000
33	#NUM!	1.36523001337712000	1.36523001341410000
34	#NUM!	1.36523001343303000	1.36523001341410000
35	#NUM!	1.36523001340441000	1.36523001341410000
36	#NUM!	1.36523001341906000	1.36523001341410000
37	#NUM!	1.36523001341156000	1.36523001341410000
38	#NUM!	1.36523001341540000	1.36523001341410000
39	#NUM!	1.36523001341343000	1.36523001341410000
40	#NUM!	1.36523001341444000	1.36523001341410000
41	#NUM!	1.36523001341392000	1.36523001341410000
42	#NUM!	1.36523001341419000	1.36523001341410000
43	#NUM!	1.36523001341405000	1.36523001341410000
44	#NUM!	1.36523001341412000	1.36523001341410000
45	#NUM!	1.36523001341408000	1.36523001341410000
46	#NUM!	1.36523001341410000	1.36523001341410000