

## Practical 1: Solution of Algebraic and Transcendental Equations

### (a) Solution of algebraic and transcendental equation by Bisection Method

**Problem Statement:** Write a Scilab Code to find the real root of the equation  $x^3 - x - 1 = 0$  using bisection method correct to four places of decimal.

**Scilab Code:**

```
//bisection method
clc;
clear;
deff('y=f(x)','y=x^3-x-1');
x1=1,x2=2;//f(1) is negative and f(2) is positive
d=0.0001;//for accuracy root
c=1;
printf('Successive approximations \t x1\t \tx2\t \tm\t \tf(m)\n');
while abs(x1-x2)>d
    m=(x1+x2)/2;
    printf('          \t%f\t%f\t%f\t%f\n',x1,x2,m,f(m));
    if f(m)*f(x1)>0
        x1=m;
    else
        x2=m;
    end
    c=c+1;//to count number of iterations
end
printf('The solution of equation after %i iteration is %g',c,m)
```

## Output:

Scilab 2023.1.0 Console

Startup execution:

loading initial environment

--> exec('E:\FYIT\bisection.sce', -1)

Succesive approximations	x1	x2	m	f (m)
1.000000	2.000000	1.500000	0.875000	
1.000000	1.500000	1.250000	-0.296875	
1.250000	1.500000	1.375000	0.224609	
1.250000	1.375000	1.312500	-0.051514	
1.312500	1.375000	1.343750	0.082611	
1.312500	1.343750	1.328125	0.014576	
1.312500	1.328125	1.320312	-0.018711	
1.320312	1.328125	1.324219	-0.002128	
1.324219	1.328125	1.326172	0.006209	
1.324219	1.326172	1.325195	0.002037	
1.324219	1.325195	1.324707	-0.000047	
1.324707	1.325195	1.324951	0.000995	
1.324707	1.324951	1.324829	0.000474	
1.324707	1.324829	1.324768	0.000214	

The solution of equation after 15 iteration is 1.32477

--> |

## (b)Solution of algebraic and transcendental equation by False Position Method

**Problem Statement:** Write a Scilab Code to find the real root of the equation  $2x^3 - x - 5 = 0$  using false position method correct to five places of decimal.

**Scilab Code:**

```
//false position method
clc;
clear;
deff('y=f(x)','y=x^3-2*x-5');
a=2,b=3;//f(2) is negative and f(3) is positive
d=0.00001;
printf('Successive iterations \ta\t b\t f(a)\t f(b)\t x1\n');
for i=1:25
    x1=b*f(a)/(f(a)-f(b))+a*f(b)/(f(b)-f(a));
    if(f(a)*f(x1))>0
        b=x1;
    else
        a=x1;
    end
    if abs(f(x1))<d
        break
    end
    printf('          \t%f %f %f %f %f\n',a,b,f(a),f(b),x1);
end
printf('The root of the equation is %f',x1);
```

## Output:

```
Scilab 2023.1.0 Console
Successive iterations      a          b          f(a)          f(b)          x1
                        2.000000  2.058824 -1.000000 -0.390800  2.058824
                        2.096559  2.058824  0.022428 -0.390800  2.096559
                        2.094511  2.058824 -0.000457 -0.390800  2.094511
The root of the equation is 2.094552
-->
```

## (c) Solution of algebraic and transcendental equation by Newton Raphson Method

**Problem Statement:** Write a Scilab Code to find the real root of the equation  $\sin x - x/2 = 0$  using Newton Raphson method correct to four places of decimal.

### Scilab Code:

```
//newton raphson method
clc;
clear;
deff('y=f(x)','y=sin(x)-x/2');
deff('y1=f1(x)','y1=cos(x)-1/2');
x0=%pi/2;      //initial value
d=0.0001;
c=0;
n=1;
printf('Successive iterations \tx0\t f(x0)\t f1(x0)\n');
while n==1
    x2=x0;
    x1=x0-(f(x0)/f1(x0));
```

```

    x0=x1;
    printf('\t%f\t%f\t%f\n',x2,f(x1),f1(x1));
    c=c+1;
    if abs(f(x0))<d then
        break;
    end
    end
    printf('The root of %i iteration is %0.4g',c,x0);

```

### Output:

```

Scilab 6.1.1 Console
Successive iterations    x0      f(x0)    f1(x0)
      1.570796      -0.090703    -0.916147
      2.000000      -0.004520    -0.824232
      1.900996      -0.000014    -0.819039
The root of 3 iteration is 1.896
-->

```