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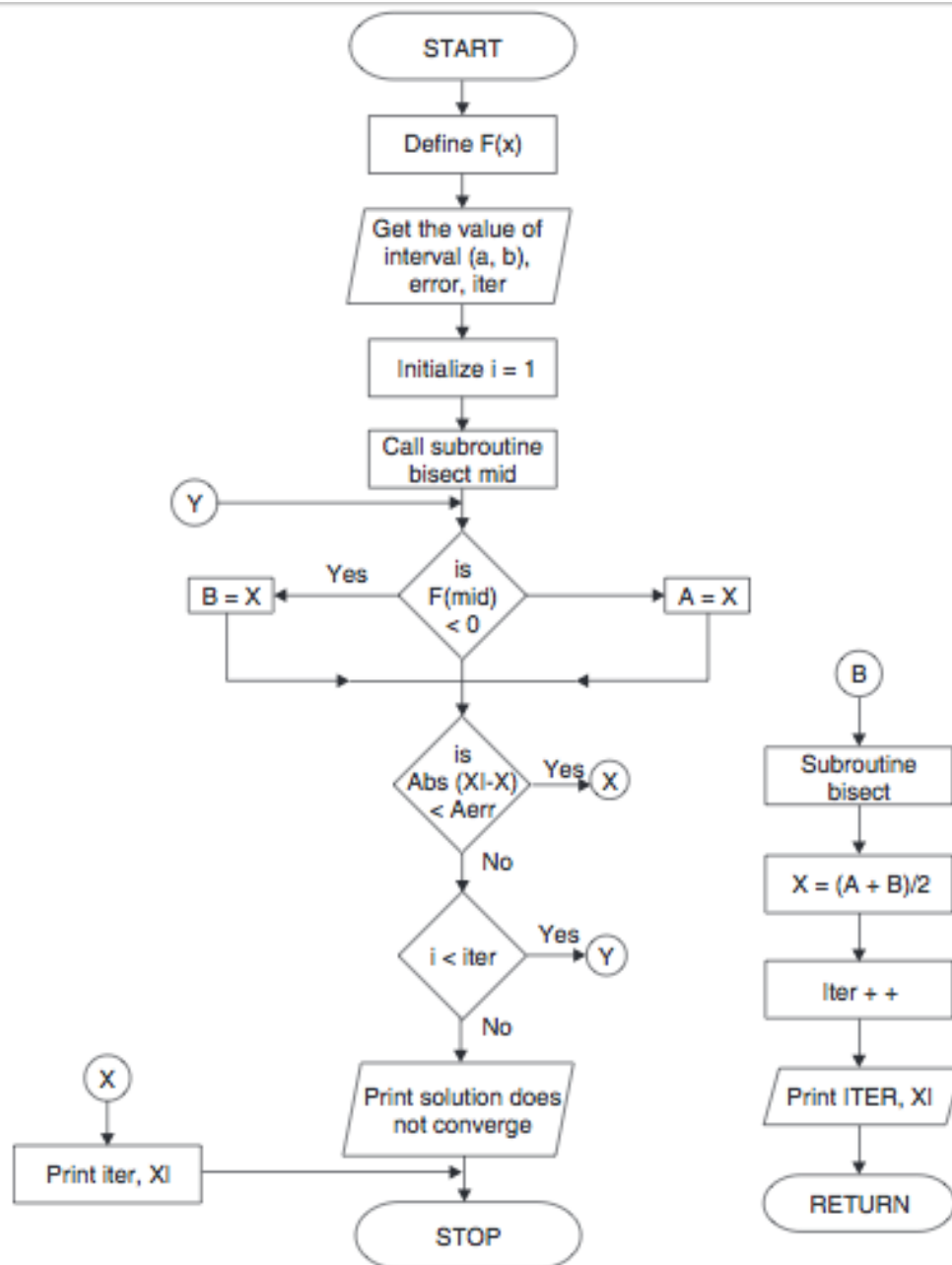
## *Numerical System Project*

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19015566  
19015603  
19015880  
19016112

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عمرو عبد الحميد محمد إبراهيم

## Bisection flowchart



Runs:

Nu... — □ ×

Numeric Project  
phase 2

Max Iterations  
50

equation

epsilon

X0

OK

Nu... — □ ×

Numeric Project  
phase 2

precision  
0

X Lower

X Upper

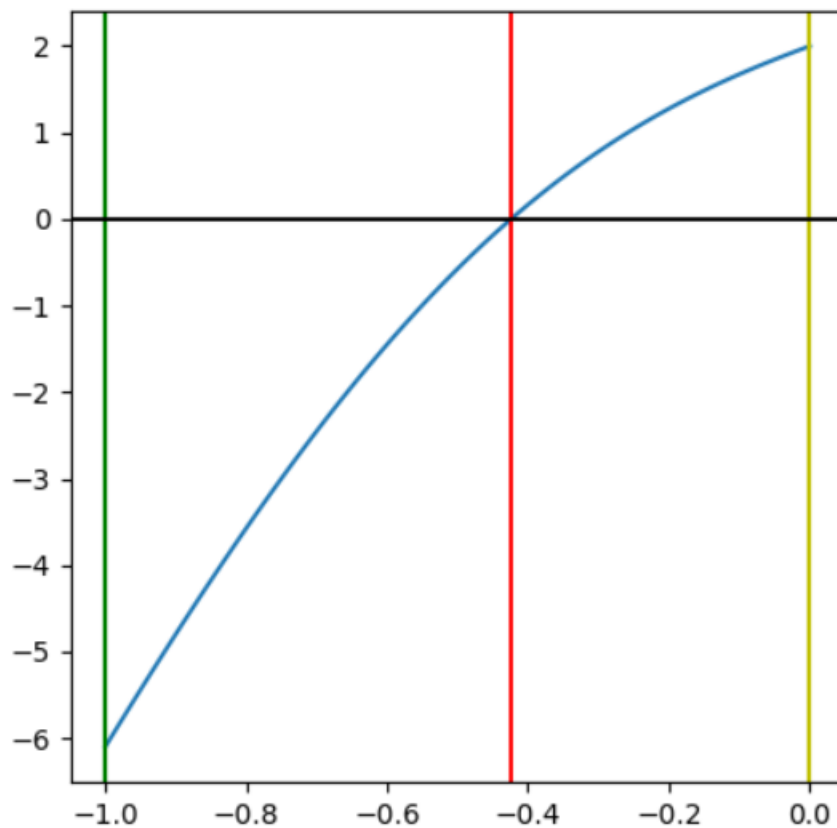
Bisection ☐

solve

Start time: 1661992865.3897138 End time: 1661992865.3937147  
Elapsed time during the whole function is : -0.00400090217590332

12.  $x_l = -0.424316$   $x_u = -0.423828$   $ans = -0.424072$   $Ea = 0.057571\%$

numGuesses = 12  
-0.424072265625 is close to solution with equation = 0.0

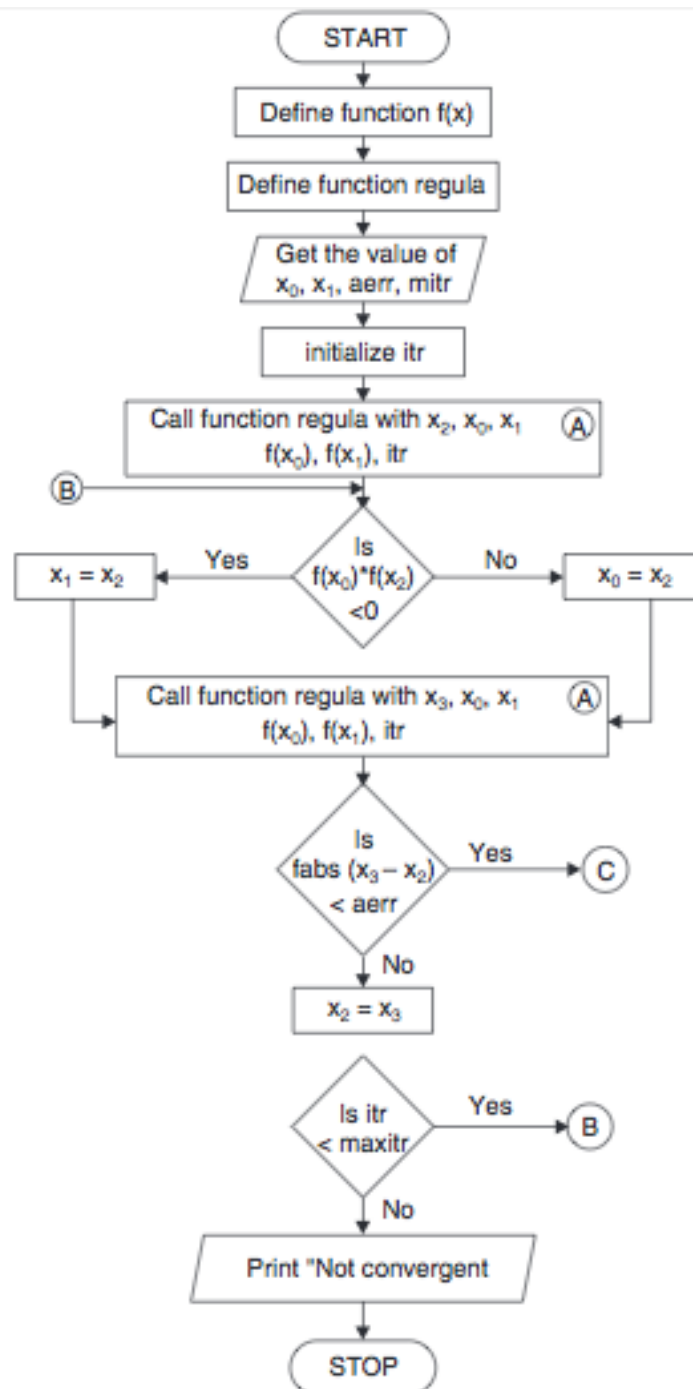


**The Bisection Method:**

01.  $x_l = -1.000000$ ,  $x_u = 0.000000$ ,  $ans = -0.500000$ ,  $Ea = 100.000000\%$   
02.  $x_l = -0.500000$ ,  $x_u = 0.000000$ ,  $ans = -0.250000$ ,  $Ea = 100.000000\%$   
03.  $x_l = -0.500000$ ,  $x_u = -0.250000$ ,  $ans = -0.375000$ ,  $Ea = 33.333333\%$   
04.  $x_l = -0.500000$ ,  $x_u = -0.375000$ ,  $ans = -0.437500$ ,  $Ea = 14.285714\%$   
05.  $x_l = -0.437500$ ,  $x_u = -0.375000$ ,  $ans = -0.406250$ ,  $Ea = 7.692308\%$   
06.  $x_l = -0.437500$ ,  $x_u = -0.406250$ ,  $ans = -0.421875$ ,  $Ea = 3.703704\%$   
07.  $x_l = -0.437500$ ,  $x_u = -0.421875$ ,  $ans = -0.429688$ ,  $Ea = 1.818182\%$   
08.  $x_l = -0.429688$ ,  $x_u = -0.421875$ ,  $ans = -0.425781$ ,  $Ea = 0.917431\%$   
09.  $x_l = -0.425781$ ,  $x_u = -0.421875$ ,  $ans = -0.423828$ ,  $Ea = 0.460829\%$

## FALSE-POSITION

### Flowchart:



Runs:

Nu...

Numeric Project  
phase 2

Max Iterations

50

equation

$*3 - 2*x**2 + 3*x + 2=0$

epsilon

0.001

X0

0

OK

Nu...

Numeric Project  
phase 2

precision

0

X Lower

-1

X Upper

0

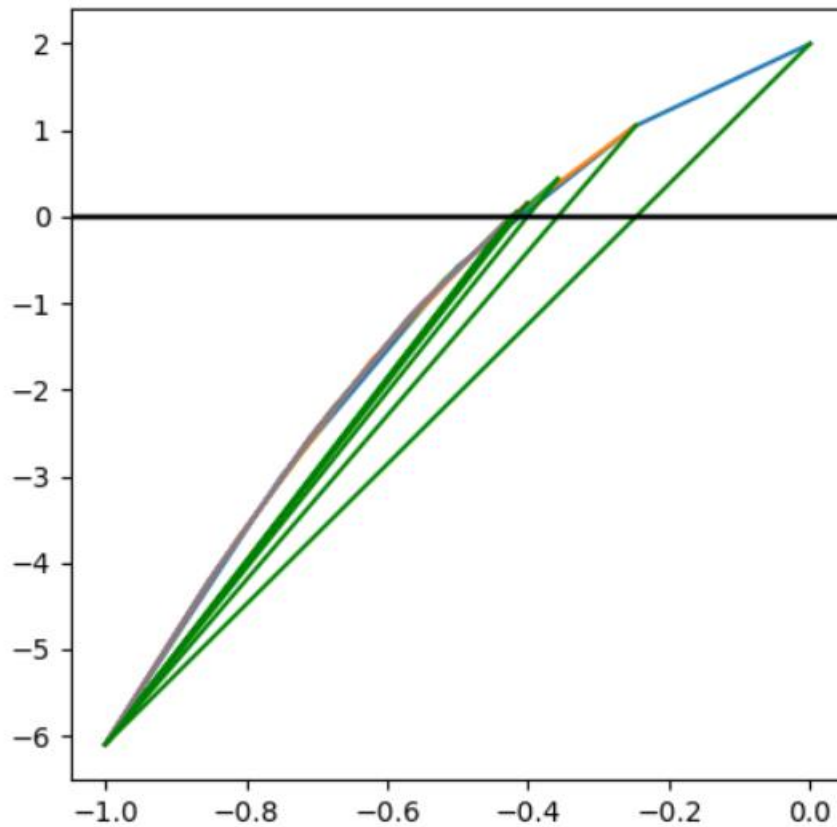
False-Position

solve

Start time: 1661993013.067578 End time: 1661993013.072576  
Elapsed time during the whole function is : -0.004997968673706055

08.  $x_l = -1.000000$   $x_u = -0.423775$   $ans = -0.423966$   $Ea = 0.045044\%$

numGuesses = 8  
-0.42396624730229815 is close to solution with equation = 0.0

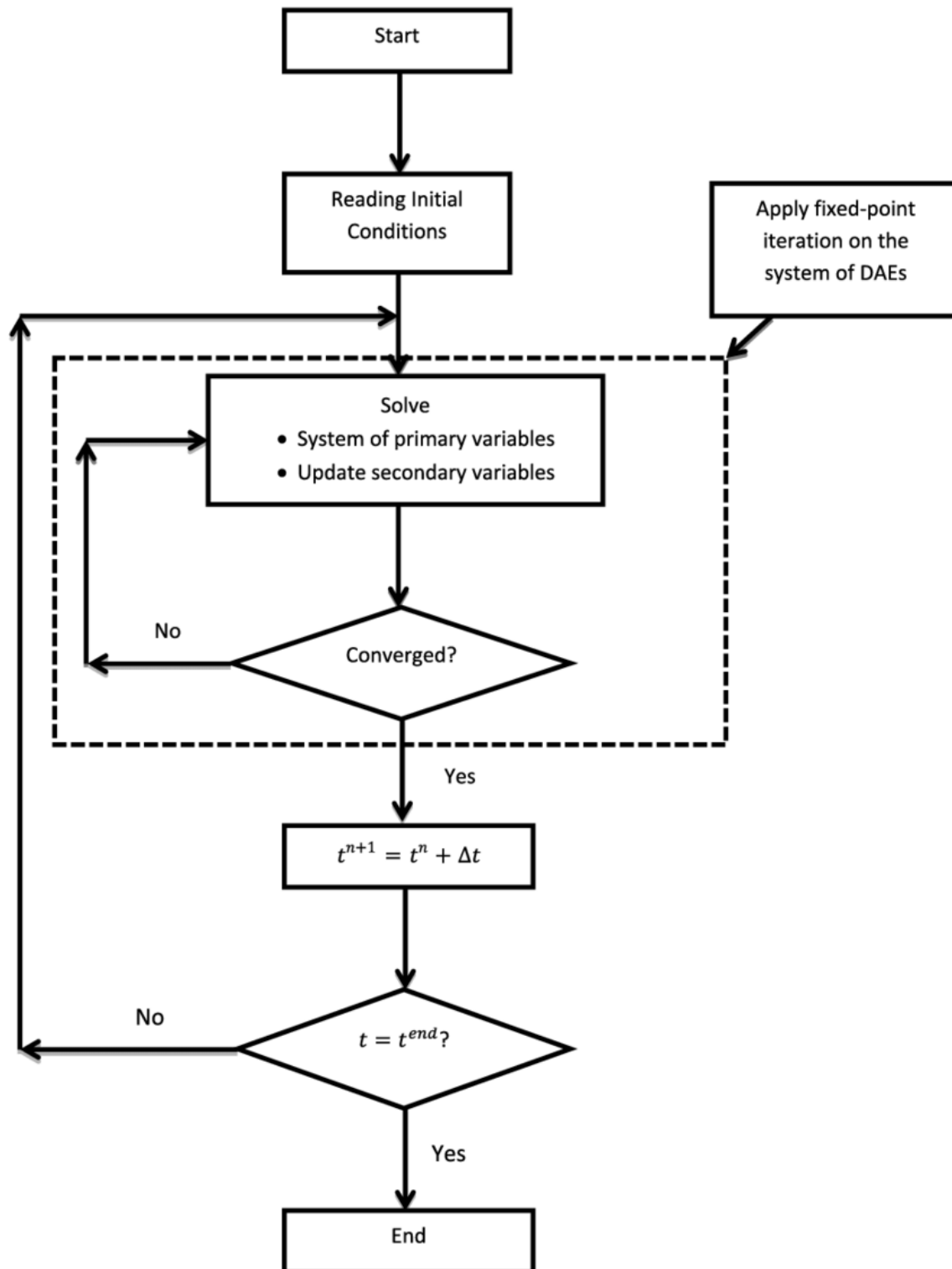


#### The False-Position Method:

01.  $x_l = -1.000000$ ,  $x_u = 0.000000$ ,  $ans = -0.246914$ ,  $Ea = 100.000000\%$   
 02.  $x_l = -1.000000$ ,  $x_u = -0.246914$ ,  $ans = -0.358104$ ,  $Ea = 31.049724\%$   
 03.  $x_l = -1.000000$ ,  $x_u = -0.358104$ ,  $ans = -0.401145$ ,  $Ea = 10.729518\%$   
 04.  $x_l = -1.000000$ ,  $x_u = -0.401145$ ,  $ans = -0.416325$ ,  $Ea = 3.646338\%$   
 05.  $x_l = -1.000000$ ,  $x_u = -0.416325$ ,  $ans = -0.421477$ ,  $Ea = 1.222269\%$   
 06.  $x_l = -1.000000$ ,  $x_u = -0.421477$ ,  $ans = -0.423201$ ,  $Ea = 0.407389\%$   
 07.  $x_l = -1.000000$ ,  $x_u = -0.423201$ ,  $ans = -0.423775$ ,  $Ea = 0.135511\%$

## FIXED-POINT

### Flowchart:





Runs:

Nu... — □ ×

Numeric Project  
phase 2

Max Iterations  
50

equation  
 $3/(x+2)=x$

epsilon  
0.001

X0  
0

OK

Nu... — □ ×

Numeric Project  
phase 2

precision  
0

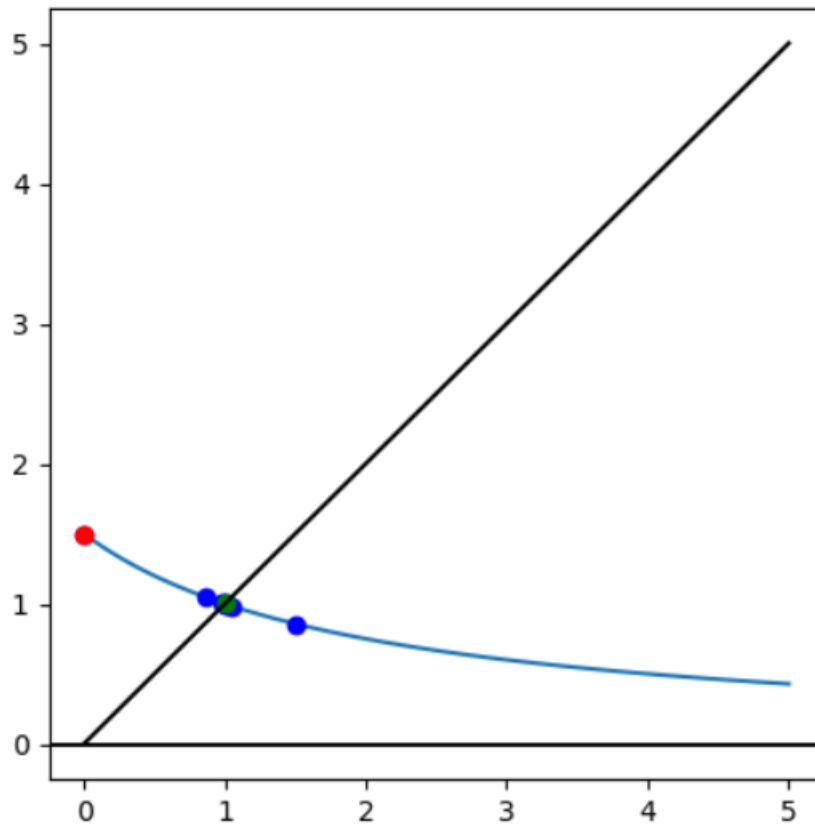
X Lower

X Upper

Fixed point

solve

Start time: 1661993171.9329617 End time: 1661993171.935009  
Elapsed time during the whole function is : -0.002047300338745117



Fixed Point :

Iteration1,xi: 1.5

Iteration2,xi: 0.8571428571428571

Approximation error: 0.6428571428571429

Iteration3,xi: 1.05

Approximation error: 0.19285714285714295

Iteration4,xi: 0.9836065573770493

Approximation error: 0.06639344262295077

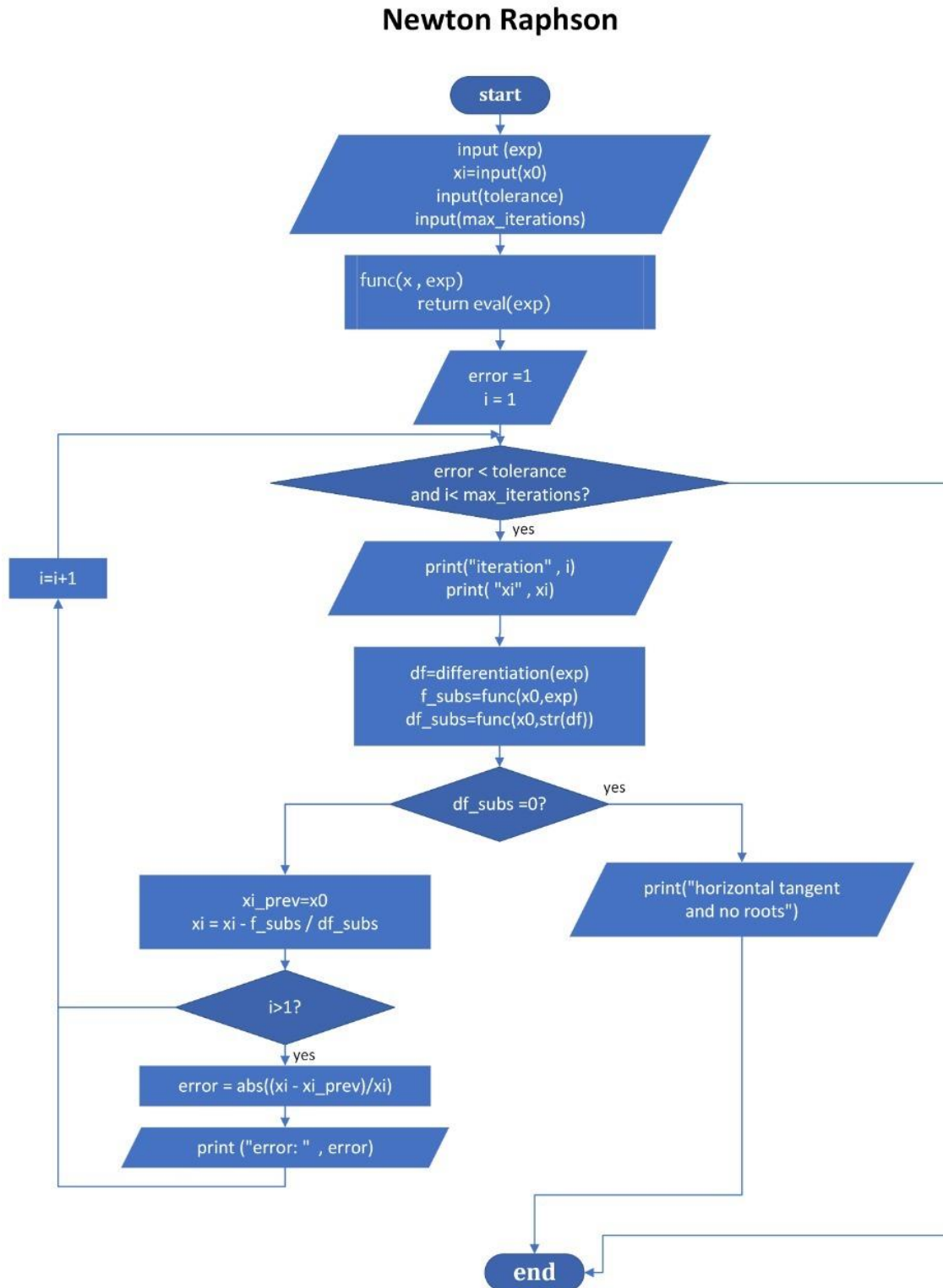
Iteration5,xi: 1.0054945054945055

Approximation error: 0.021887948117456202



## NEWTON-RAPHSON

### Flowchart:



Runs:

Nu...

Numeric Project  
phase 2

Max Iterations

50

equation

$x^2 + 3.993 \cdot 10^{-4} = 0$

epsilon

X0

0.05

OK

Nu...

Numeric Project  
phase 2

precision

0

X Lower

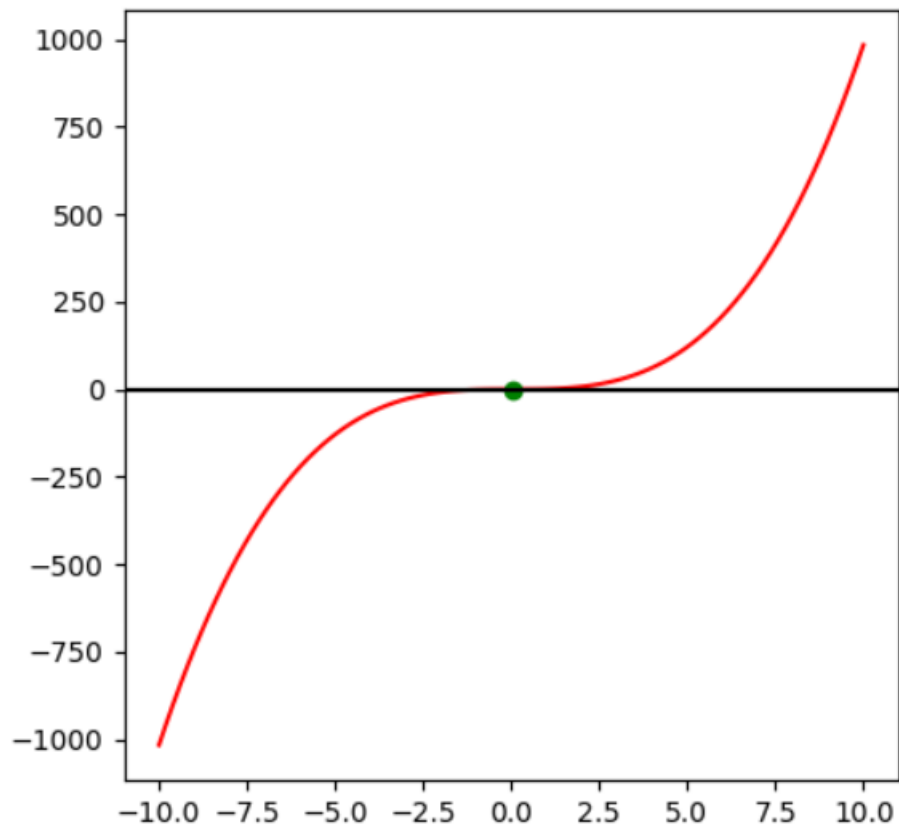
X Upper

Newton-Raphson

solve



Start time: 1661993362.9971964 End time: 1661993363.095321  
Elapsed time during the whole function is : -0.09812450408935547



Newton Raphson

Iteration 1 xi: 0.05

Iteration 2 xi: 0.062422222222221

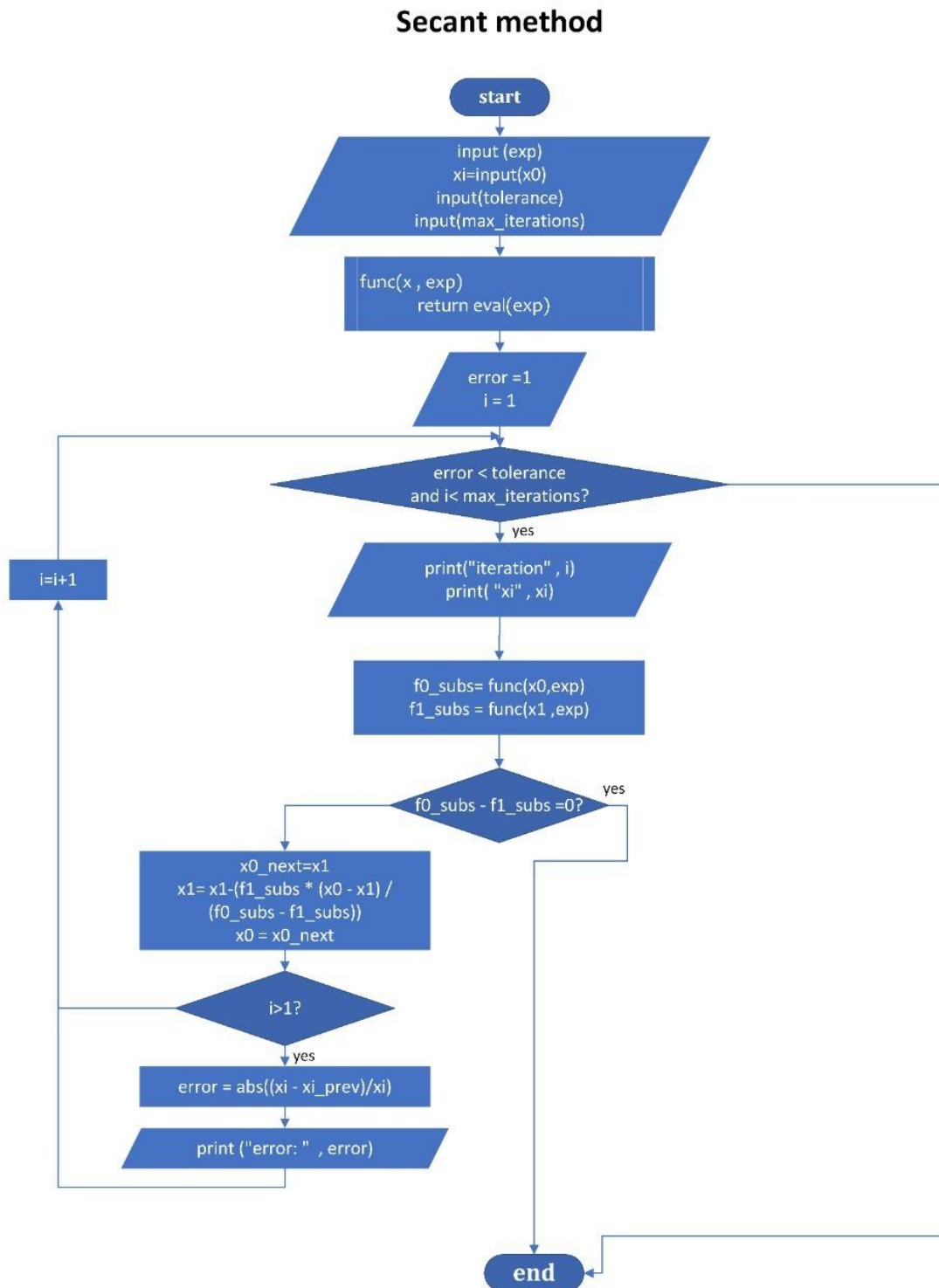
Approximation error: 0.0007157328198740867

Iteration 3 xi: 0.062377576543465846

Approximation error: 7.968060769175679e-08

## SECANT METHOD

### Flowchart:



Runs:

Nu...

Numeric Project  
phase 2

Max Iterations

50

equation

$x^3 - 5x + 1 = 0$

epsilon

X0

OK

Nu...

Numeric Project  
phase 2

precision

0

X Lower

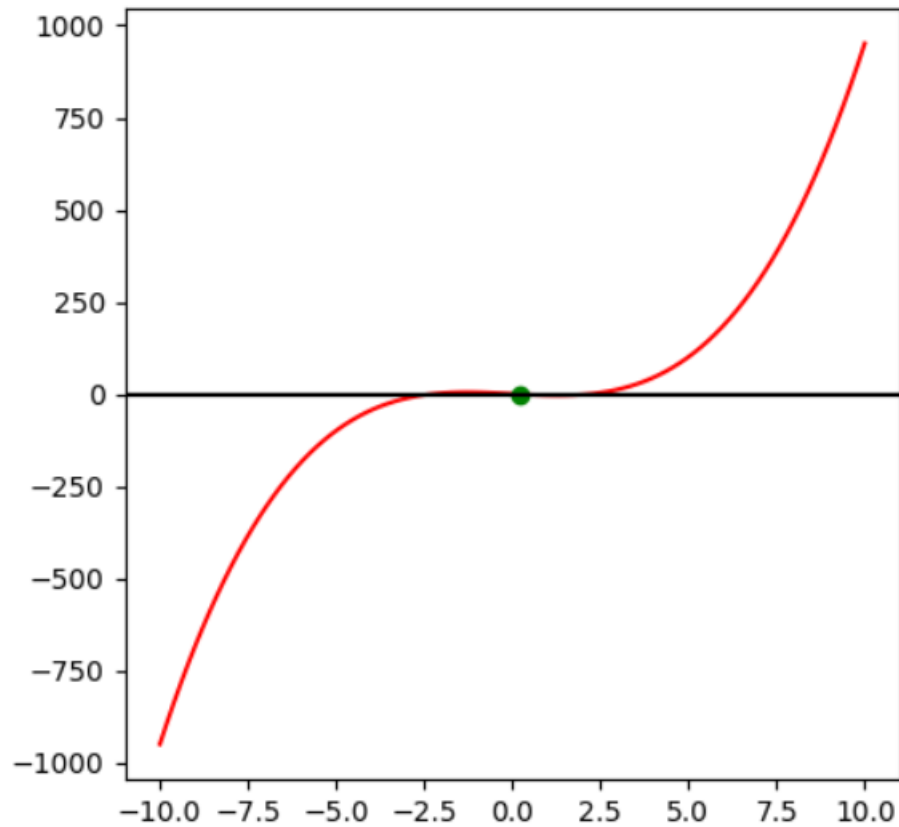
1

X Upper

Secant Method

solve

Start time: 1661993536.8858714 End time: 1661993536.888823  
Elapsed time during the whole function is : -0.0029516220092773438



```
Iteration1,xi: 1.0
Iteration2,xi: 0.25
Approximation error: 3.0
Iteration3,xi: 0.1864406779661017
Approximation error: 0.3409090909090909
Iteration4,xi: 0.20173625617912722
Approximation error: 0.07581967913315567
Iteration5,xi: 0.2016398528913041
Approximation error: 0.0004780964002938867
Iteration6,xi: 0.20163967572128236
```



```
Iteration2,xi: 0.25  
Approximation error: 3.0  
Iteration3,xi: 0.1864406779661017  
Approximation error: 0.3409090909090909  
Iteration4,xi: 0.20173625617912722  
Approximation error: 0.07581967913315567  
Iteration5,xi: 0.2016398528913041  
Approximation error: 0.0004780964002938867  
Iteration6,xi: 0.20163967572128236  
Approximation error: 8.786466309422042e-07
```