FUNCTIONS:

function [r, h] = bisection(a, b, f, p, t)

h = [];

cond = true;

while cond

assert(sign(f(a)) ~= sign(f(b)),"bounds wrong")

if 0 < a && 0 < b

m = sqrt(a\*b);

elseif a < 0 && b < 0

m = -sqrt(a\*b);

elseif a == 0

m = realmin;

elseif b == 0

m = -realmin;

elseif a < 0 && b > 0

m = 0;

end

h = [h [a;b;f(m)]];

if m == a || m == b

cond = false;

end

if (b-a) <= t\*min(abs(a), abs(b))

cond = false;

end

if f(m) == 0

cond = false;

end

if sign(f(m)) == sign(f(a)) || m == realmin

a = m;

elseif sign(f(m)) == sign(f(b)) || m == -realmin

b = m;

end

end

r = m;

function result = funcB(x)

result = (2\*sin(x)) - x;

function result = funcC(x)

result = (1/x) + log(x) - 2;

function result = funcD(x)

result = (x - (eps^3))^3;

function result = funcE(x)

result = arctan(x-(eps^2));

[a,b] = bisection(1,2,@funcB,0,eps)

RESULTS:

a =

1.8955

b =

Columns 1 through 5

1.0000 1.4142 1.6818 1.8340 1.8340

2.0000 2.0000 2.0000 2.0000 1.9152

0.5613 0.3059 0.0971 -0.0327 0.0345

Columns 6 through 10

1.8742 1.8946 1.8946 1.8946 1.8946

1.9152 1.9152 1.9049 1.8997 1.8971

0.0015 -0.0154 -0.0069 -0.0027 -0.0006

Columns 11 through 15

1.8946 1.8952 1.8952 1.8954 1.8955

1.8959 1.8959 1.8955 1.8955 1.8955

0.0005 -0.0001 0.0002 0.0001 -0.0000

Columns 16 through 20

1.8955 1.8955 1.8955 1.8955 1.8955

1.8955 1.8955 1.8955 1.8955 1.8955

0.0000 0.0000 0.0000 -0.0000 0.0000

Columns 21 through 25

1.8955 1.8955 1.8955 1.8955 1.8955

1.8955 1.8955 1.8955 1.8955 1.8955

-0.0000 -0.0000 -0.0000 -0.0000 0.0000

Columns 26 through 30

1.8955 1.8955 1.8955 1.8955 1.8955

1.8955 1.8955 1.8955 1.8955 1.8955

0.0000 -0.0000 0.0000 -0.0000 0.0000

Columns 31 through 35

1.8955 1.8955 1.8955 1.8955 1.8955

1.8955 1.8955 1.8955 1.8955 1.8955

-0.0000 0.0000 0.0000 0.0000 -0.0000

Columns 36 through 40

1.8955 1.8955 1.8955 1.8955 1.8955

1.8955 1.8955 1.8955 1.8955 1.8955

-0.0000 0.0000 -0.0000 0.0000 -0.0000

Columns 41 through 45

1.8955 1.8955 1.8955 1.8955 1.8955

1.8955 1.8955 1.8955 1.8955 1.8955

-0.0000 0.0000 -0.0000 -0.0000 -0.0000

Columns 46 through 50

1.8955 1.8955 1.8955 1.8955 1.8955

1.8955 1.8955 1.8955 1.8955 1.8955

0.0000 -0.0000 -0.0000 -0.0000 0.0000

Columns 51 through 53

1.8955 1.8955 1.8955

1.8955 1.8955 1.8955

-0.0000 -0.0000 0

fsolve(@funcB,2) - bisection(1,2,@funcB,0,eps)

ans =

1.7500e-10

1.7500e-10 / fsolve(@funcB, 2)

ans =

9.2324e-11

[a,b] = bisection(0,1,@funcC,0,eps)

a =

0.3178

b =

1.0e+307 \*

Columns 1 through 5

0 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

4.4942 0.0000 0.0000 0.0000 0.0000

Columns 6 through 10

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

Columns 11 through 15

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 -0.0000 0.0000 -0.0000 0.0000

Columns 16 through 20

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 0.0000 0.0000 0.0000 0.0000

Columns 21 through 25

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 -0.0000 0.0000 0.0000 -0.0000

Columns 26 through 30

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 0.0000 -0.0000 -0.0000 -0.0000

Columns 31 through 35

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 -0.0000

Columns 36 through 40

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 -0.0000 -0.0000 0.0000 0.0000

Columns 41 through 45

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 -0.0000 0.0000

Columns 46 through 50

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 -0.0000 -0.0000 -0.0000 0.0000

Columns 51 through 55

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 -0.0000 0.0000 0.0000 -0.0000

Columns 56 through 60

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

Columns 61 through 62

0.0000 0.0000

0.0000 0.0000

0.0000 0

fsolve(@funcC,0.5) - bisection(0,1,@funcC,0,eps)

ans =

-1.4155e-14

1.4155e-14 / fsolve(@funcC, 0.5)

ans =

4.4534e-14

[a,b] = bisection(6,7,@funcC,0,eps)

a =

6.3054

b =

Columns 1 through 5

6.0000 6.0000 6.2357 6.2357 6.2961

7.0000 6.4807 6.4807 6.3571 6.3571

0.0231 -0.0093 0.0069 -0.0012 0.0028

Columns 6 through 10

6.2961 6.2961 6.3037 6.3037 6.3037

6.3265 6.3113 6.3113 6.3075 6.3056

0.0008 -0.0002 0.0003 0.0000 -0.0001

Columns 11 through 15

6.3046 6.3051 6.3054 6.3054 6.3054

6.3056 6.3056 6.3056 6.3055 6.3054

-0.0000 -0.0000 0.0000 0.0000 -0.0000

Columns 16 through 20

6.3054 6.3054 6.3054 6.3054 6.3054

6.3054 6.3054 6.3054 6.3054 6.3054

0.0000 -0.0000 0.0000 -0.0000 -0.0000

Columns 21 through 25

6.3054 6.3054 6.3054 6.3054 6.3054

6.3054 6.3054 6.3054 6.3054 6.3054

0.0000 -0.0000 0.0000 0.0000 0.0000

Columns 26 through 30

6.3054 6.3054 6.3054 6.3054 6.3054

6.3054 6.3054 6.3054 6.3054 6.3054

-0.0000 0.0000 0.0000 0.0000 0.0000

Columns 31 through 35

6.3054 6.3054 6.3054 6.3054 6.3054

6.3054 6.3054 6.3054 6.3054 6.3054

0.0000 0.0000 0.0000 -0.0000 -0.0000

Columns 36 through 40

6.3054 6.3054 6.3054 6.3054 6.3054

6.3054 6.3054 6.3054 6.3054 6.3054

0.0000 0.0000 0.0000 0.0000 -0.0000

Columns 41 through 45

6.3054 6.3054 6.3054 6.3054 6.3054

6.3054 6.3054 6.3054 6.3054 6.3054

-0.0000 -0.0000 0.0000 0.0000 0.0000

Columns 46 through 47

6.3054 6.3054

6.3054 6.3054

0.0000 0

c = fsolve(@funcC, 6) - a

c =

-2.3664e-06

c/fsolve(@funcC,6)

ans =

-3.7530e-07

[a,b] = bisection(-1,2,@funcD,0,eps)

a =

1.0948e-47

b =

Columns 1 through 5

-1.0000 0 0.0000 0.0000 0.0000

2.0000 2.0000 2.0000 2.0000 2.0000

-0.0000 -0.0000 -0.0000 -0.0000 0.0000

Columns 6 through 10

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 -0.0000 0.0000 0.0000 0.0000

Columns 11 through 15

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 0.0000 -0.0000 -0.0000 0.0000

Columns 16 through 20

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 -0.0000 0.0000 0.0000 0.0000

Columns 21 through 25

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 0.0000 -0.0000 -0.0000 0.0000

Columns 26 through 30

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 -0.0000 0.0000 0.0000 0.0000

Columns 31 through 35

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 0.0000 -0.0000 -0.0000 0.0000

Columns 36 through 40

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 -0.0000 0.0000 0.0000 0.0000

Columns 41 through 45

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 0.0000 -0.0000 -0.0000 0.0000

Columns 46 through 50

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 -0.0000 0.0000 0.0000 0.0000

Columns 51 through 55

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 0.0000 -0.0000 -0.0000 0.0000

Columns 56 through 60

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 -0.0000 0.0000 0.0000 -0.0000

Columns 61 through 62

0.0000 0.0000

0.0000 0.0000

0.0000 0

fsolve(@funcD,0)

ans =

0

fsolve(@funcD,0) - bisection(-1,2,@funcD,0,eps)

ans =

-1.0948e-47

[a,b] = bisection(-1,2,@funcE,0,eps)

a =

4.9304e-32

b =

Columns 1 through 5

-1.0000 0 0.0000 0.0000 0.0000

2.0000 2.0000 2.0000 2.0000 2.0000

-0.0000 -0.0000 -0.0000 -0.0000 -0.0000

Columns 6 through 10

0.0000 0.0000 0.0000 0.0000 0.0000

2.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 -0.0000 0.0000 -0.0000

Columns 11 through 15

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 0.0000 -0.0000 -0.0000 -0.0000

Columns 16 through 20

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 -0.0000 0.0000 -0.0000

Columns 21 through 25

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 0.0000 -0.0000 -0.0000 -0.0000

Columns 26 through 30

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 -0.0000 0.0000 -0.0000

Columns 31 through 35

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 0.0000 -0.0000 -0.0000 -0.0000

Columns 36 through 40

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 -0.0000 0.0000 -0.0000

Columns 41 through 45

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 0.0000 -0.0000 -0.0000 -0.0000

Columns 46 through 50

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 -0.0000 0.0000 -0.0000

Columns 51 through 55

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

-0.0000 0.0000 -0.0000 -0.0000 -0.0000

Columns 56 through 60

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 -0.0000 0.0000 -0.0000

Columns 61 through 64

0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000

-0.0000 -0.0000 -0.0000 0

fsolve(@funcE, 0) - a

ans =

-4.9304e-32

diary off

Blue Line: y = x

Orange Line: y = 2sin(x)

A close up of a map

Description automatically generated