Thais Minet

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Lab 2 Bisection Method

1. Find an approximation to the square root of 13, correct to within ten to the -4 power, using the Bisection Algorithm.

```
>> bisection(@(x) x.^2 - 13, 1, 5, 10.^-4, 30)
iteration 1
c =  3
err =  2
a =  3

iteration 2
c =  4
err =  1
b =  4

iteration 3
c =  3.5000
err =  0.50000
a =  3.5000

iteration 4
c =  3.7500
err =  0.25000
b =  3.7500

iteration 5
c =  3.6250
err =  0.12500
b =  3.6250

iteration 6
c =  3.5625
err =  0.062500
a =  3.5625

iteration 7
c =  3.5938
```

```
err =  0.031250
a =  3.5938

iteration 8
c =  3.6094
err =  0.015625
b =  3.6094

iteration 9
c =  3.6016
err =  0.0078125
a =  3.6016

iteration 10
c =  3.6055
err =  0.0039062
a =  3.6055

iteration 11
c =  3.6074
err =  0.0019531
b =  3.6074

iteration 12
c =  3.6064
err =    9.7656e-04
b =  3.6064

iteration 13
c =  3.6060
err =    4.8828e-04
b =  3.6060

iteration 14
c =  3.6057
err =    2.4414e-04
b =  3.6057

iteration 15
c =  3.6056
err =    1.2207e-04
b =  3.6056

iteration 16
```

```
c =  3.6055
err =    6.1035e-05
ans =  3.6055
```

The answer is 3.6055

Verification by direct calculation:

>> sqrt(13)

ans = 3.605551275

So the result of the bisection algorithm agrees with the “calculator” to the specified precision.

2. Find an approximation to the cube root of 36, correct to within ten to the -4 power, using the Bisection Algorithm.

```
>> bisection(@(x) x.^3 - 36, 1, 5, 10.^-4, 30)
iteration 1
c =  3
err =  2
a =  3

iteration 2
c =  4
err =  1
b =  4

iteration 3
c =  3.5000
err =  0.50000
b =  3.5000

iteration 4
c =  3.2500
err =  0.25000
a =  3.2500

iteration 5
c =  3.3750
err =  0.12500
```

```
b =  3.3750

iteration 6
c =  3.3125
err =  0.062500
b =  3.3125

iteration 7
c =  3.2812
err =  0.031250
a =  3.2812

iteration 8
c =  3.2969
err =  0.015625
a =  3.2969

iteration 9
c =  3.3047
err =  0.0078125
b =  3.3047

iteration 10
c =  3.3008
err =  0.0039062
a =  3.3008

iteration 11
c =  3.3027
err =  0.0019531
b =  3.3027

iteration 12
c =  3.3018
err =    9.7656e-04
a =  3.3018

iteration 13
c =  3.3022
err =    4.8828e-04
b =  3.3022

iteration 14
c =  3.3020
```

```
err =    2.4414e-04
b =  3.3020

iteration 15
c =  3.3019
err =    1.2207e-04
a =  3.3019

iteration 16
c =  3.3019
err =    6.1035e-05
ans =  3.3019
```

The answer is 3.3019

>> cbrt(36)

ans = 3.30192725

So the result of the bisection algorithm agrees with the “calculator” to the specified precision.