Bisection Method

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Algorithm 1 Bisection

```
1: procedure BISECTION
 2:
       X_i
       X_s
 3:
       tol
 4:
 5:
       iter
       Y_i = f(X_i)
 6:
 7:
       Y_s = f(X_s)
       if Y_i * Y_s \ge 0 then
 8:
            "The roots are not equal"
 9:
       else if Y_i = 0 then
10:
           "X_i is a root"
11:
       else if Y_s = 0 then
12:
           "X_s is a root"
13:
       else X_m = (X_i + X_s)
14:
15:
           Y_m = f(X_m)
16:
           Error = tol^{'*}2
17:
           Cont = 1 //Because an X_m was already compute
18:
           while Y_m \neq 0 \& error > tol \& cont \leq iter do
19:
20:
               if Y_m * Y_i < 0 then
                   X_s = X_m
21:
                   Y_s = Y_m
22:
               else
23:
24:
                   X_i = X_n
                   Y_i = Y_m
25:
               end if
26:
               Aux = X_m
X_m = (X_i + X_s)
27:
28:
29:
               err = ||X_m - Aux||
               Cont = Cont + 1 \\
30:
           end while
31:
           if Y_m = 0 then
32:
               "X_m is a root"
33:
           else if error < tol then
34:
               X_m is a root with an error of error
35:
           else if Cont > iter then
36:
               "We have ran out of iterations"\\
37:
           end if
38:
39:
       end if
40: end procedure
```