## 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
14:
            X_m = \frac{(X_i + X_s)}{2}Y_m = f(X_m)
15:
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:
                if Y_m * Y_i < 0 then
20:
                     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:
                \begin{aligned} Aux &= X_m \\ X_m &= \frac{(X_i + X_s)}{2} \\ err &= \|X_m - Aux\| \end{aligned}
27:
28:
29:
                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
```