

1 Bisection Method

Suppose we want to find a root of the function $f(x)$ on the interval $[a, b]$ using the bisection method. Here is the algorithm:

1. Let $c = \frac{a+b}{2}$ be the midpoint of the interval.
2. Evaluate $f(c)$.
3. If $f(c) = 0$, then c is the root and we are done.
4. If $f(c)$ has the same sign as $f(a)$, then the root is in the interval $[c, b]$. Set $a = c$ and go to step 1.
5. If $f(c)$ has the same sign as $f(b)$, then the root is in the interval $[a, c]$. Set $b = c$ and go to step 1.

The bisection method is guaranteed to converge to a root of $f(x)$ provided that $f(x)$ is continuous on $[a, b]$ and $f(a)$ and $f(b)$ have opposite signs.