# Bisection Method

The bisection method is used to find the roots of a polynomial equation.

Advantages

1. Since the bisection method discards 50% of the current interval at each step, it brackets the root much more quickly than the incremental method does.

To compare:

* On average, assuming a root is somewhere on the interval between 0 and 1, it takes 6-7 function evaluations to estimate the root to within 0.1 accuracy.
* Those same 6-7 function evaluations using bisection estimates to root to within ½^4=0.625 to ½^5=0.031 accuracy

1. Simple and easy to implement
2. One function evaluation per iteration
3. The number of iterations can be determined a prior
4. No knowledge of the derivatives is needed
5. The function does not have to be differentiable

Disadvantages

* Slow to converge
* Good intermediate approximation may be discarded
* Like incremental search, the bisection method only finds roots where the function crosses the x axis. It cannot find roots where the function is tangent to the x axis.
* Like incremental search, the bisection method can be fooled by singularities in the function.
* Like incremental search, the bisection method cannot find complex roots of polynomials.

# Newton Raphson Method

The Newton-Rapson method is a way to quickly find a good approximation for the root valued function.

Advantages

* One of the fastest methods which converges to root quickly
* Converges on the root quadratically i.e rate of convergence is 2
* As we go near to root, number of significant digits approximately double with each step
* It makes this method useful to get precise results for a root which was previously obtained from some other convergence method
* Easy to convert to multiple dimension

Disadvantages

* We must to find the derivative to use this method
* Poor global convergence properties
* Dependent on initial guess

1. May be too far from local root
2. May encounter a zero derivative
3. May loop indefinitely

# False Position Method

False position method is an algorithm for finding roots which retains the prior estimate for which the function value has opposite sign from the function value at the current best estimate of the root.

Advantages

* It does not require the derivative calculation
* This method has first order rate of convergence i.e. it is linearly convergent. It always convergence

Disadvantages

* As it is trial and error method in some cases it may take larger time span to calculate the correct root and thereby slowing down the process
* It is used to calculate only a single unknown in the equation