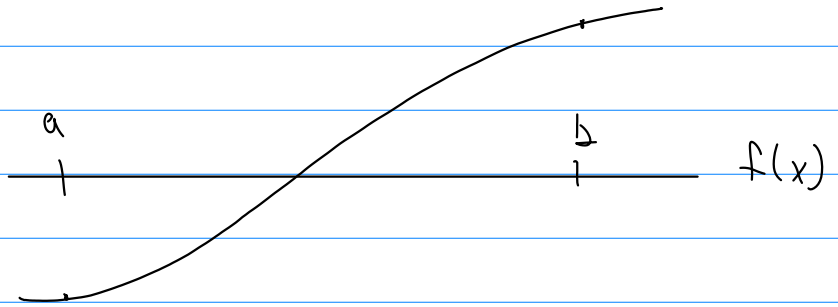
Bisection Method

Method to find a root of $f(x)$ in the range

Requires that .

Why? Since $f(x)$ is continuous, if $f(a)f(b)<0$, then $f(a)$ & $f(b)$ have

Intermediate Value Theorem: Let $f(x)$ be a continuous function over the interval such that have opposite signs. There is at least one in the open interval such that



Bisection method uses this fact.

Let $a < b$ be known such that $f(a)f(b) < 0$.

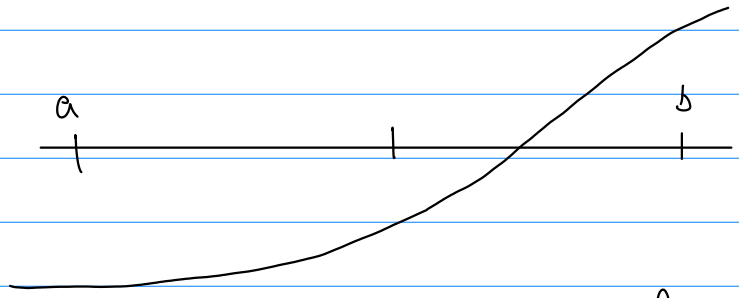
Set $m =$ ← the middle point.

If $|b-a| < \delta$ return

$f(a)f(m) < 0$, Set as new interval & repeat

$f(m)f(b) < 0$, Set as new interval & repeat

$|f(m)| < \varepsilon$ return



New range

Convergence is linear :

This method will always converge.

Issue: If any $f'(x) = 0$ in (a, b) you may miss roots: