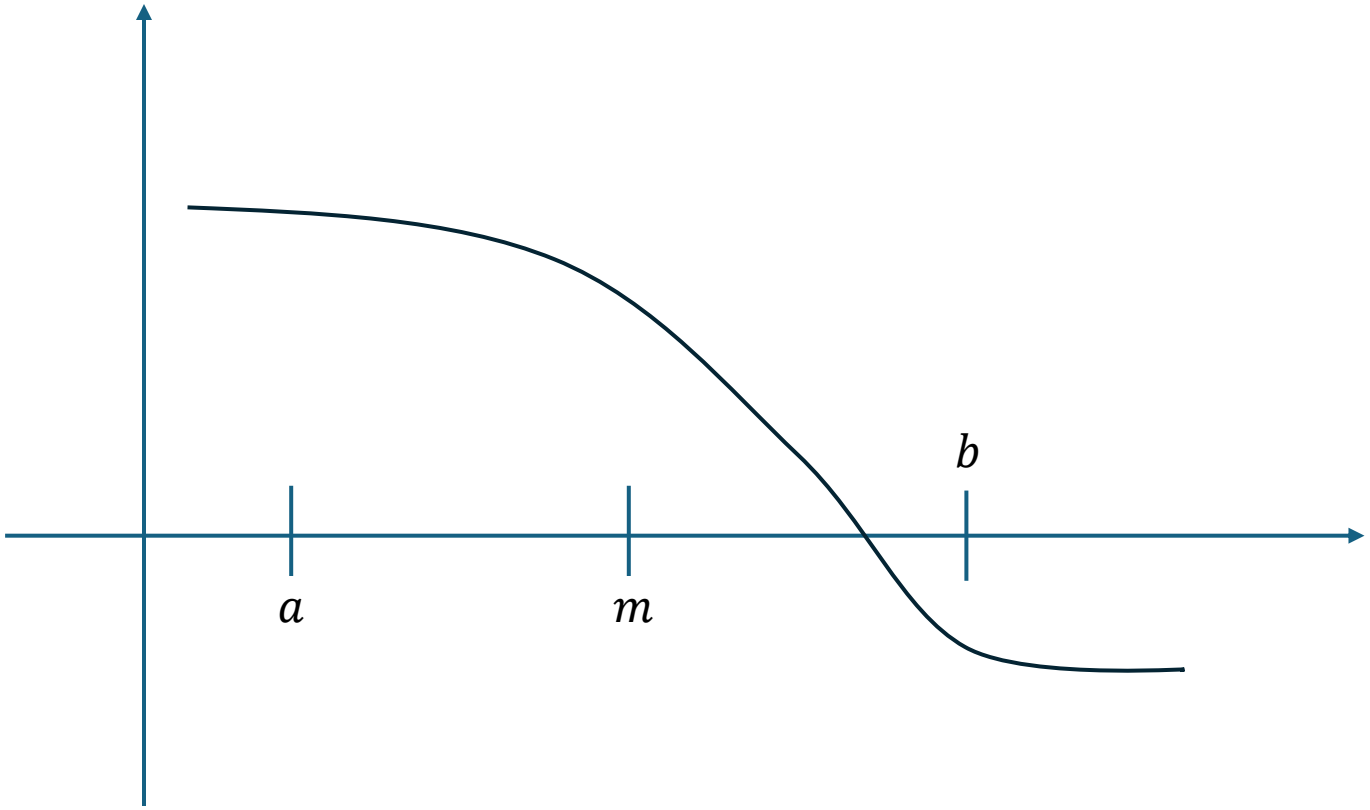
Bisection Searches

Bisection Search

- Given a continuous function f you can use bisection search to
  - Find a root of the function, i.e. a point x such that $f(x) = 0$
  - Find a local minimum, i.e. a point x such that every point z in a neighborhood of x has $f(x) \leq f(z)$
  - Find a local maximum
- Do not confuse this with binary search in ordered sequences of values

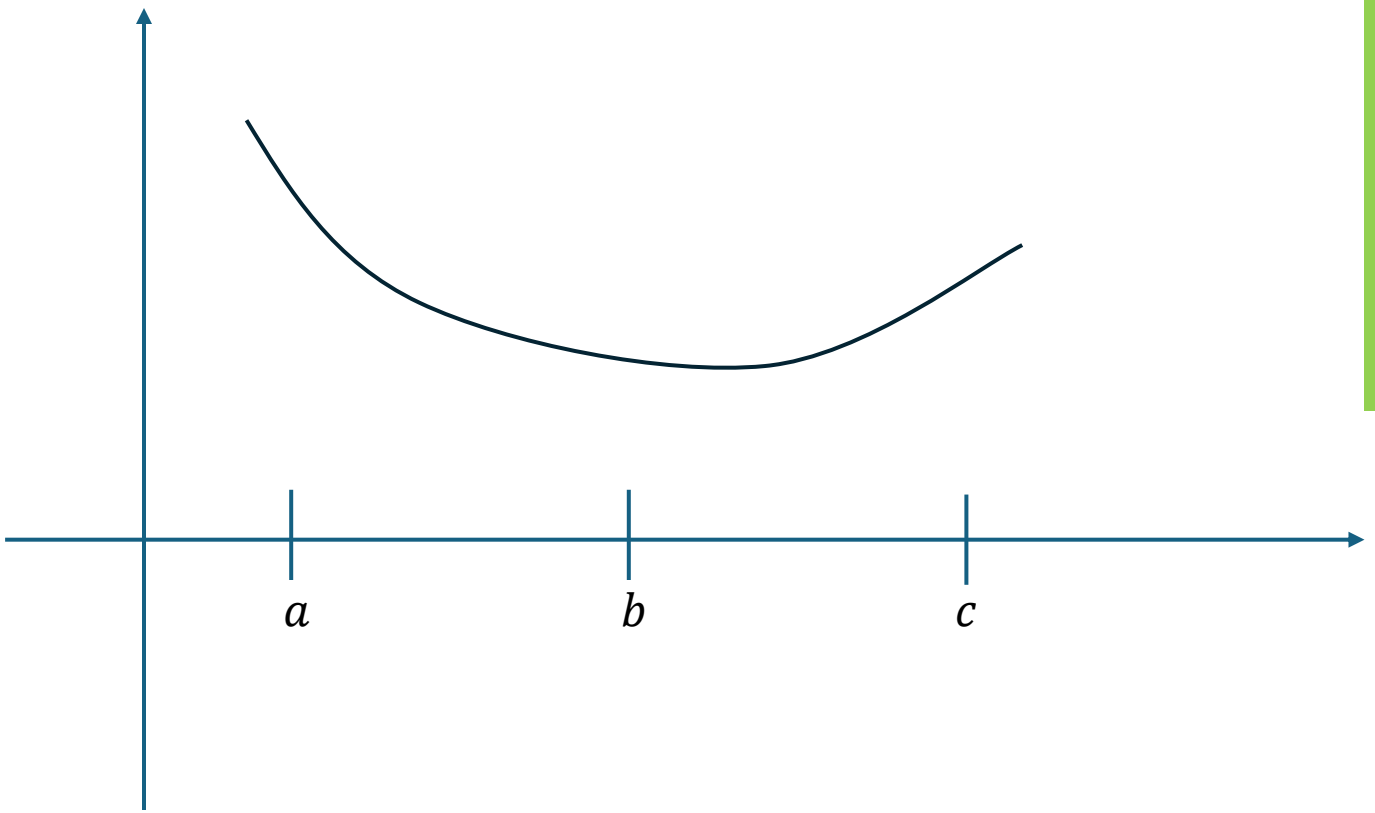
Finding a root



Given an interval $[a, b]$ such that $f(a) \times f(b) \leq 0$, compute $m = (a + b)/2$ and then continue searching in either $[a, m]$ or $[m, b]$

Eventually the interval becomes so small that we are satisfied and we then stop searching and return that interval or a point in it

Finding a local minimum



Given an interval $[a, c]$ such that for $b = (a + c)/2$ we have $f(b) \leq f(a)$ and $f(b) \leq f(c)$ we compute $m_1 = (a + b)/2$ and $m_2 = (b + c)/2$ and then continue searching in either $[a, b]$, or $[m_1, m_2]$, or $[b, c]$

Eventually the interval becomes so small that we are satisfied and we then stop searching and return that interval or a point in it