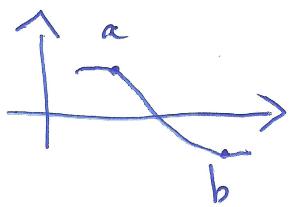
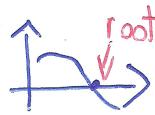
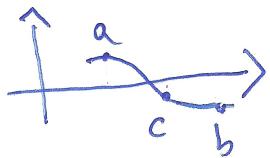


Non-linear problems

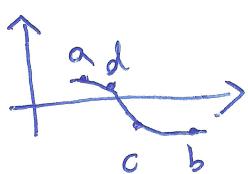
Bisection method: finding the root.



take $[a, b]$
 $>_{\text{root}} <_{\text{root}}$



take midpoint
between $[a, c]$ & $[c, b]$



& repeat
Keep going till it's as close to the
root as we want.

algorithm:

if $|f(a)| \leq \text{eps}$ return a .

if $|f(b)| \leq \text{eps}$ return b .

while ($|a+b|/2 \geq \text{eps}$) {

 mid = $a+b/2$

 if $(f(a), f(mid)) < 0$ $b = mid$

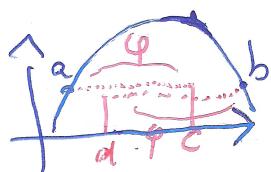
 else $a = mid$

} return $(a+b)/2$

Optimization

Golden Search: find the maximum of our range.

Same as bisection but instead of taking 1 point in the midpoint, take 2^o



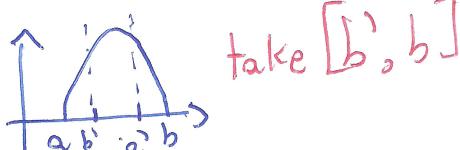
$$\varphi = \text{golden ratio} = \frac{\sqrt{5}-1}{2} = 0.61803$$

now take either $[a, c]$ or $[c, b]$
& repeat.

Note: take golden ratio with respect to the distance

Notes if midpoint falls between the 2 new points, always take

the higher one:



take $[b', b]$