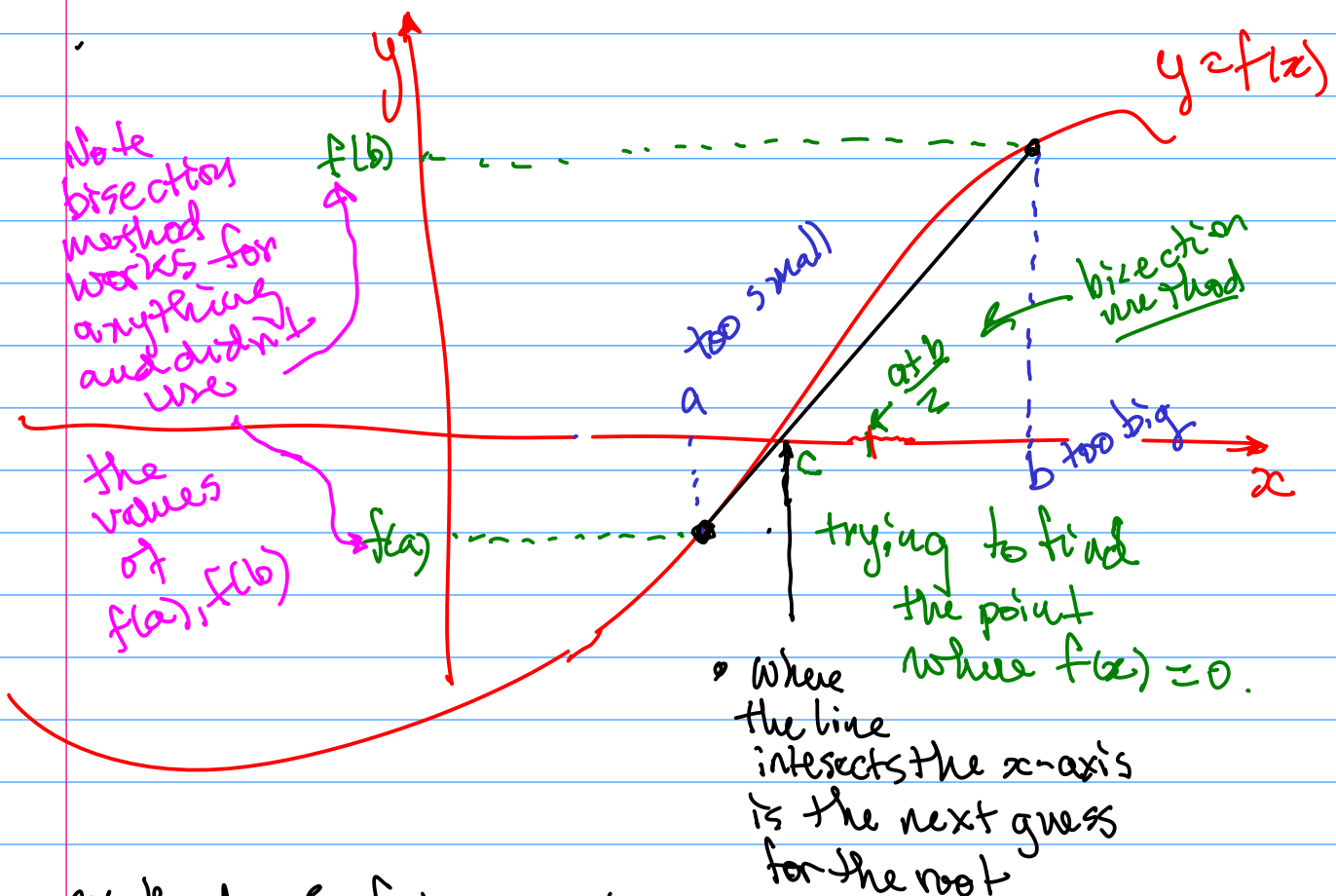
Method of false position

As mentioned in the Prologue, the *method of false position*† dates back to the ancient Egyptians. It remains an effective alternative to the bisection method for solving the equation $f(x) = 0$ for a real root between a and b, given that f is continuous and $f(a)$ and $f(b)$ have opposite signs.

- Were hieroglyphics a good idea?
- What about GUIs?
- What about the method of false position?

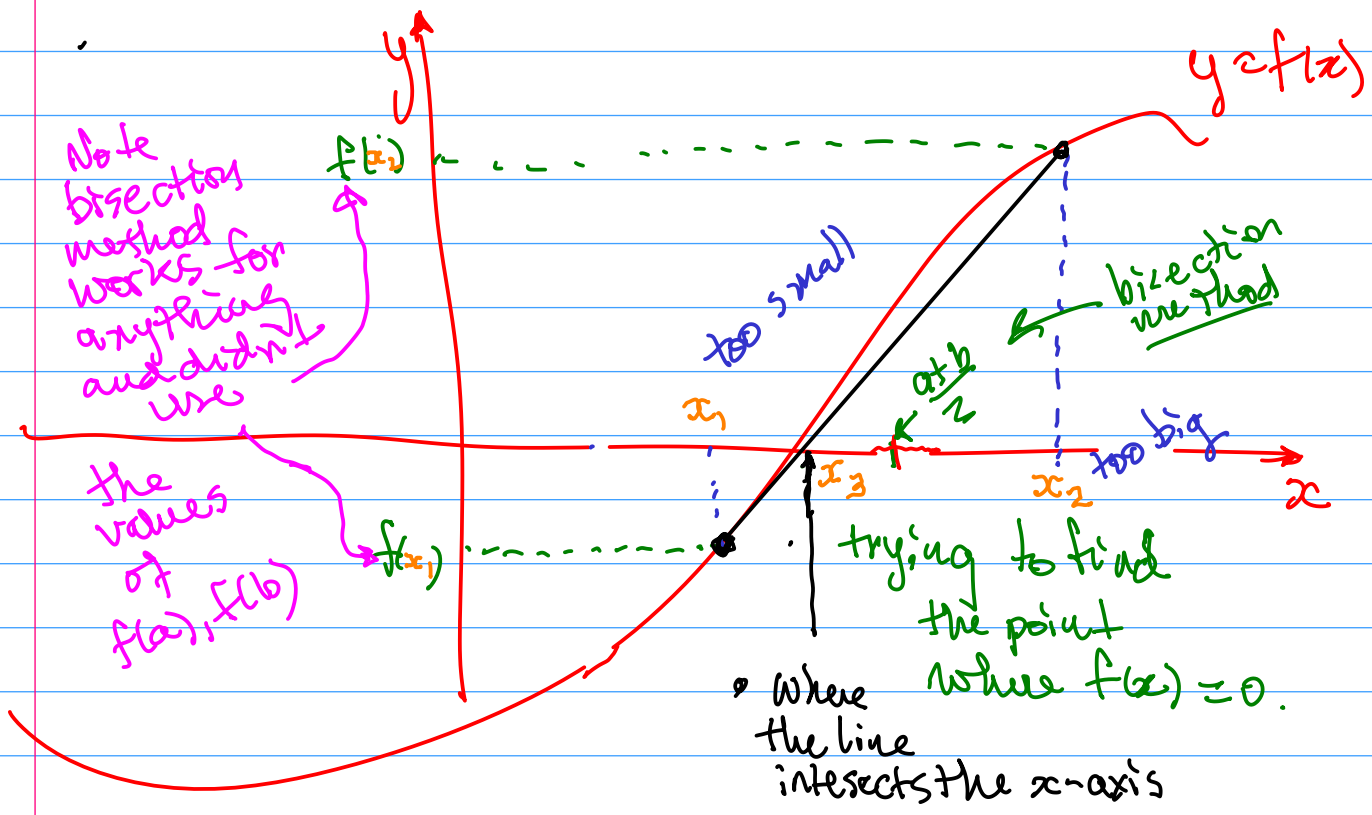


Method of false position:

if $f(c) < 0$ then
    $a = c$
else
    $b = c$
end

exactly like the bisection method and guaranteed the root is always in the interval $[a, b]$

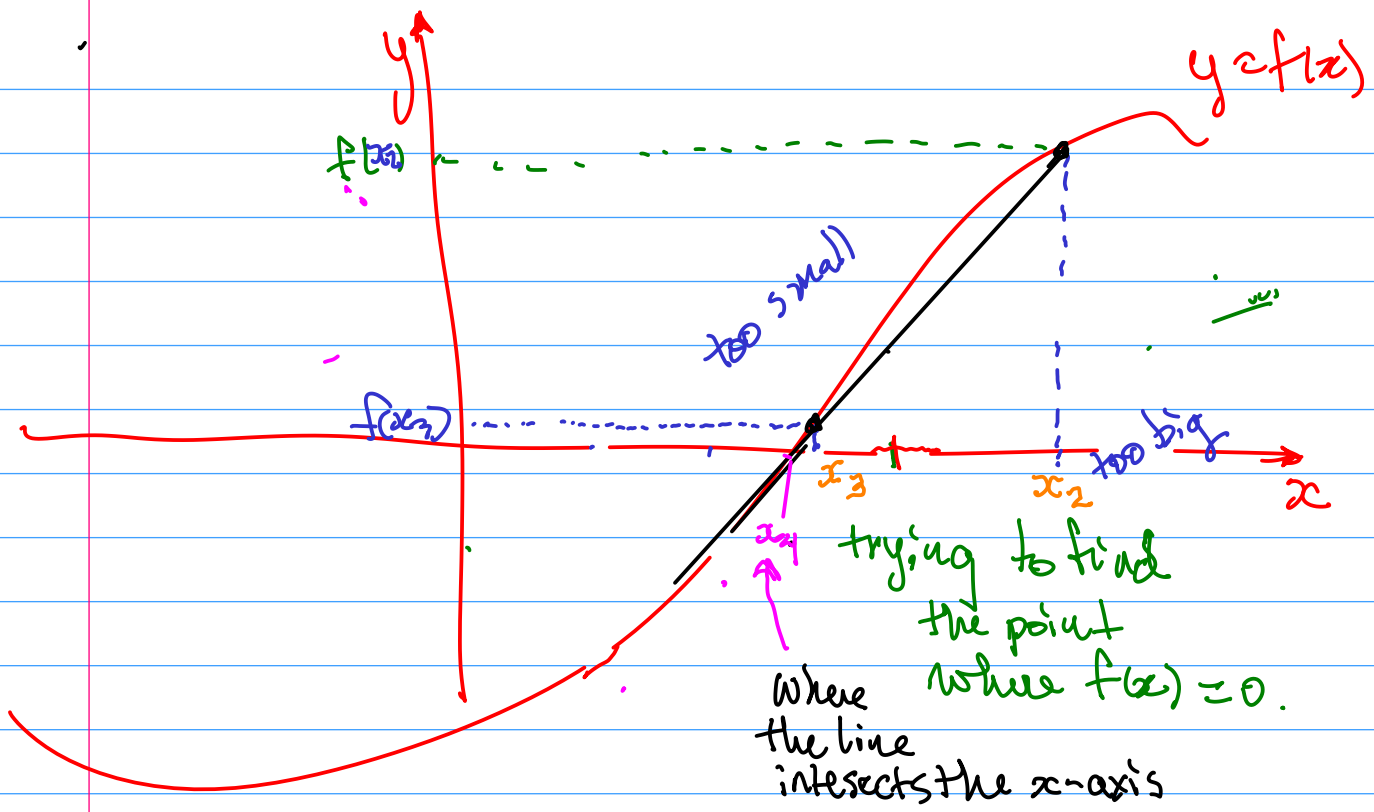
How is the secant method different? don't view a and b as endpoints of an interval...



Now there is no replacement of a or b with c to maintain an interval that contains the solution...

Instead we consider the two most recent values of x for the next approximation...

What is x_4?



Secant method

This idea converges much faster, (if it converges at all and it might not!)

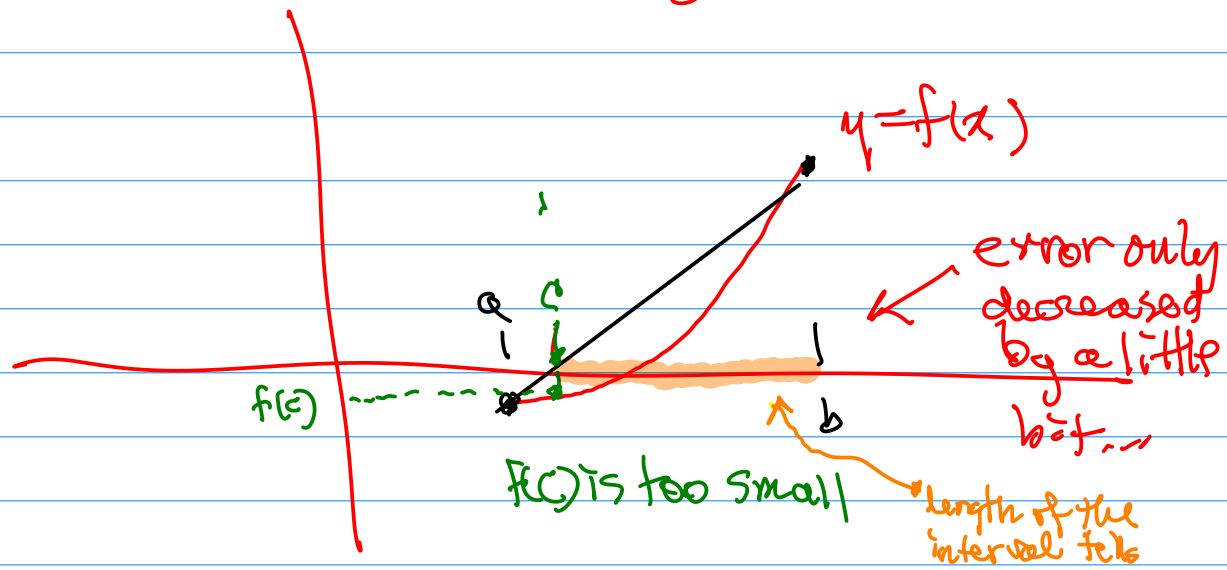
Bad
- Doesn't always converge because we don't keep track of an interval $[a,b]$ that contains the solution.

Good
- When it works, it converges faster since we always use the most recent approximations of the root to find the next approximation.

Bisection method guarantees the error decreased by ½ each step...

What about false position?

It might converge even more slowly than the bisection method:



If $f(c)<0$ then

$a=c$

else

$b=c$

end

New interval is still quite big!