1. Bisection Method: solve an equation.

$x + 3 = 0 \Rightarrow x = -3$

$f(x) = x^2$

$f(a) = a^2$

2. Set up:

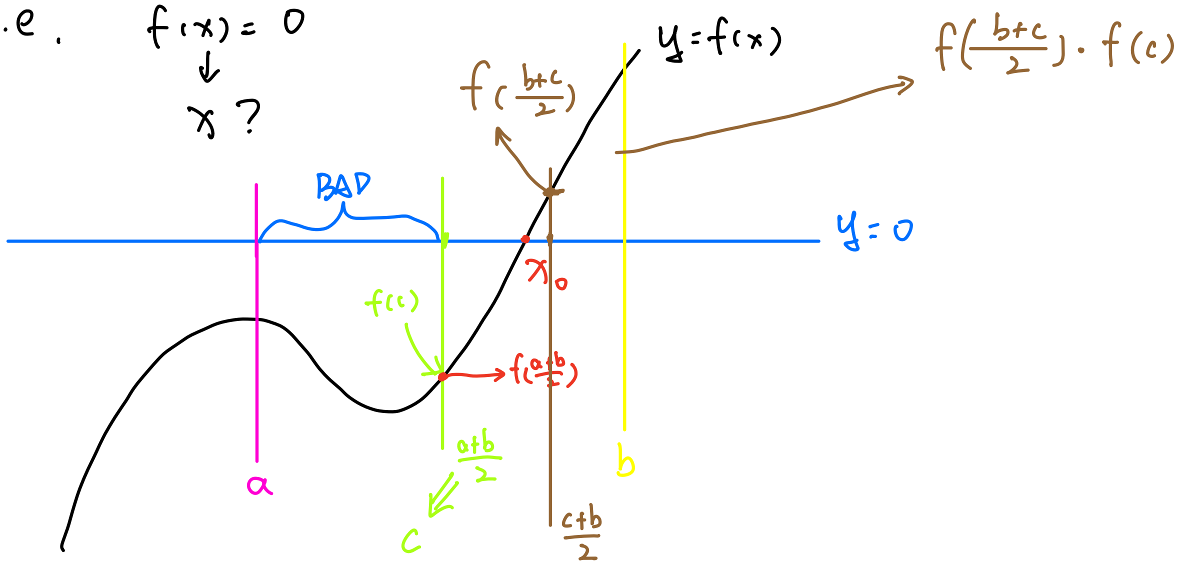
Given a function $f(\cdot)$, calculate it's zero point:

i.e. $f(x) = 0$

$\downarrow$

x ?

3.



Step 1: Initialize the boundary of the interval satisfying $f(a) \cdot f(b) < 0$

Step 2: Calculate $f\left(\frac{a+b}{2}\right)$ — x_0 is not between a and $\frac{a+b}{2}$

if $f\left(\frac{a+b}{2}\right) \cdot f(a) > 0$, that means no zero point! So, $\frac{a+b}{2} < x_0 < b$

Pseudo Code:

bisec_method ← function()

Arguments:

① : Target function : a function

② : Boundary : numeric, vector of 2
first element is left bound, sencond is right

③ : Stopping cretoria :

case 1 : f(x) = 0

case 2 : Tolerence : 10^{-6}

case 3 : maximum iteration steps.

```
bisec_meth ← function(
    ①: tf
    ②: bd ←
    ③: tol
    ④: max_iter ){

    a ← bd[1]
    b ← bd[2]
    if (tf(a)·tf(b) > 0){stop("Bad IN1")}

for(iter in 1:max_iter){

update c    c ← (a+b)/2

update      if (f(c)=0){return(c)}
a, b                                    #   x0 between a and c. useful bd is (a,c)
            if (f(a)·f(c) < 0){b ← c} else{a ← c}
```

$f(a)\cdot f(c) > 0$

```
if (|a-b| < tol) { return( a ) }
if ( iter == max_iter) { warning ("Out of Iter")
                         return(a) }.

  }
}
```