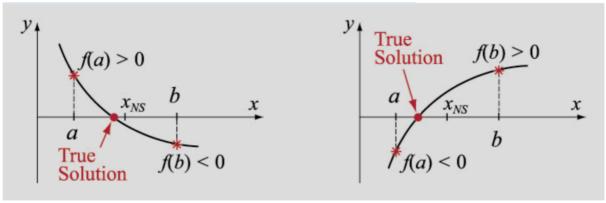
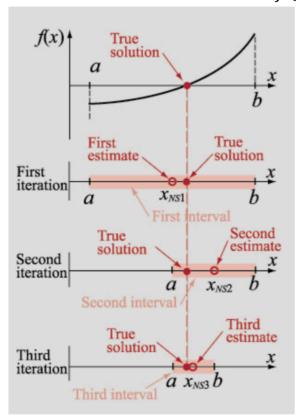
# 1. Solving non-linear equation using Bisection method

Due to a lot of mathematical problem cannot be solve by using analysis method by derive everything to calculate. Numerical Analysis is the way to solve the value of such an equation by using some technique to approximate the nearest value of true solution. Bisection Method is based on splitting x-interval into two halves



IF f(x) has a root between a and b THEN  $f(a) \times f(b) < 0$ 

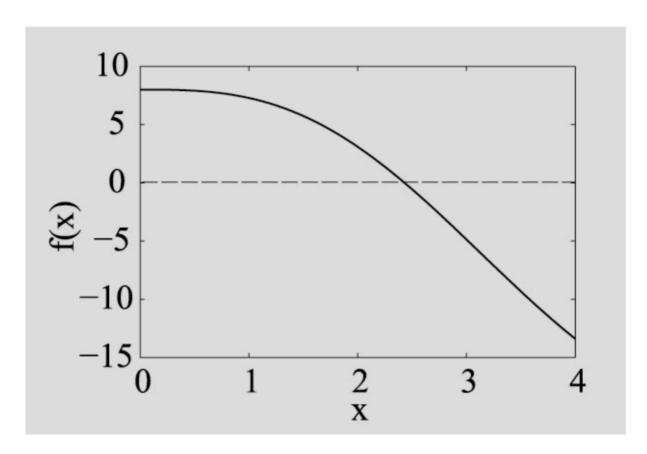


### Algorithm

- 1. Use the given point of interval by finding a and b such that f(a) imes f(b) < 0
- 2. Calculate the first estimate solution  $x_{ns}=rac{a+b}{2}$
- 3. Determine the range with true solution
  - 1. if  $f(a) \cdot f(x_{ns}) < 0$ , the true solution is between a and  $x_{ns1}$
  - 2. if  $f(a) \cdot f(x_{ns}) > 0$ , the true solution is between  $x_{ns1}$  and b
- 4. Select subinterval obtained from step 3 and go back to step 2
- 5. Calculate tolerance by  $tolerance = \frac{b-a}{2}$
- 6. Repeat step 2 to 5 until specified tolerance attained

#### Example

Find the value of x from equation  $8-4.5(x-\sin x)=0$  by using Bisection method with tolerance of less than 0.001 radian



Iteration	а	b	$x_{ns}$	$f(x_{ns})$	$tolerance = \frac{b-a}{2}$
1	2	.3	2.5	-0.556875	0.5
2	2	2.5	2.25	1.376329	0.25
3	2.25	2.5	2.375	0.434083	0.125
4	2.375	2.5	2.4375	0.055709	0.0625
5	2.375	2.4375	2.40625	0.190661	0.03125
:	:	:	•	•	:
10	2.429688	2.431641	2.430664	-0.001569	0.00977

# x = 2.430664 ANS

### Problem

Use an introduced method to find value of x in equation  $c_1+c_2(x-\sin x)=0$  the algorithm must be stop when tolerance attained By using a this given argument a, b,  $c_1$ ,  $c_2$  and tolerance