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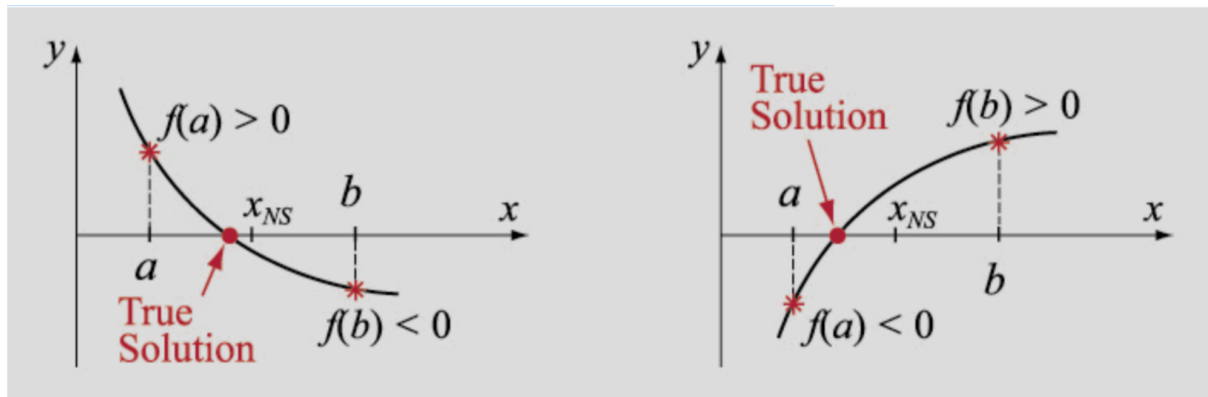
*IF $f(x)$ has a root between a and b THEN $f(a) \times f(b) < 0$*
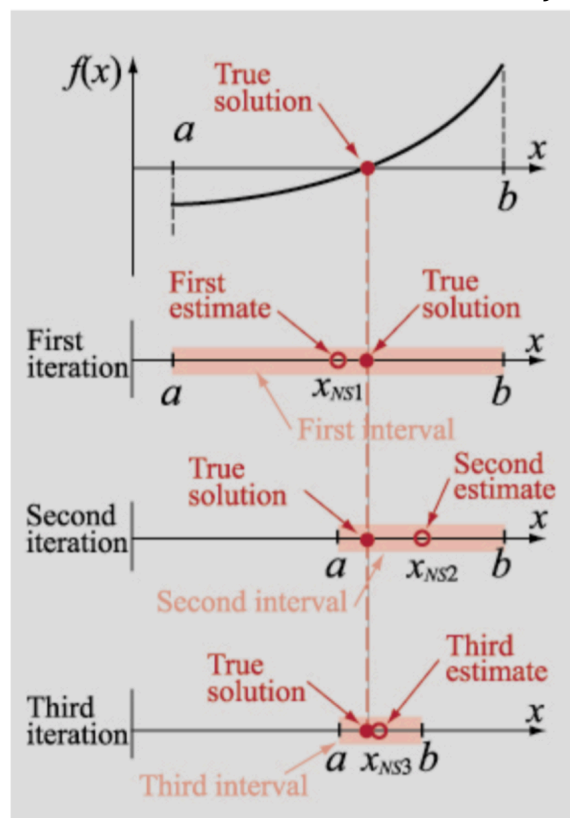
Algorithm

1. Use the given point of interval by finding a and b such that $f(a) \times f(b) < 0$
2. Calculate the first estimate solution $x_{ns} = \dfrac{a+b}{2}$
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 $tolerance = \dfrac{b-a}{2}$
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
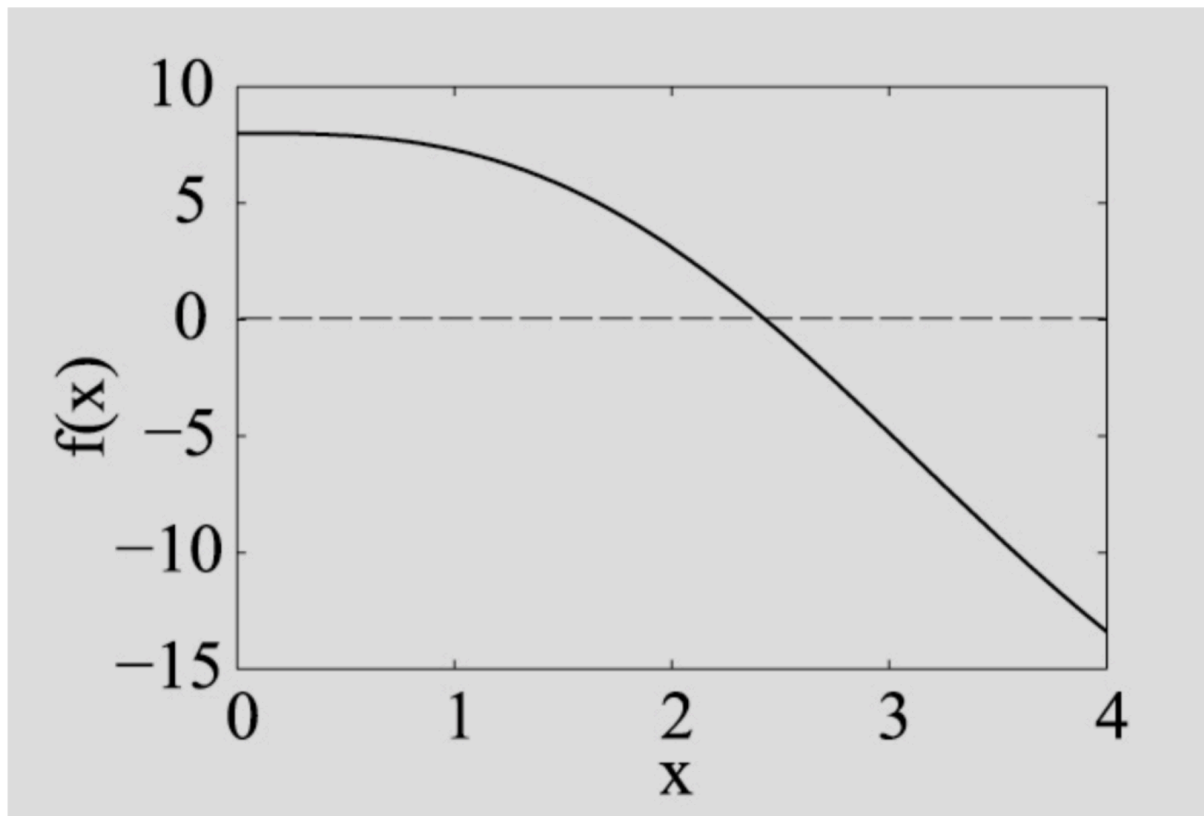
Iteration	a	b	x_{ns}	$f(x_{ns})$	$tolerance = \frac{b-a}{2}$
1	2	3	2.5	-0.556875	0.5
2	2	2.5	2.25	1.376329	0.25
3	2.25	2.5	2.375	0.434083	0.125
4	2.375	2.5	2.4375	0.055709	0.0625
5	2.375	2.4375	2.40625	0.190661	0.03125
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$
10	2.429688	2.431641	2.430664	-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