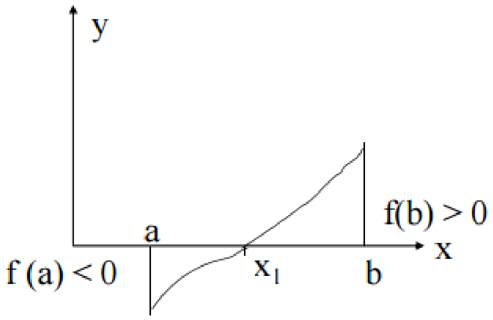
المحاضرة الثالثة

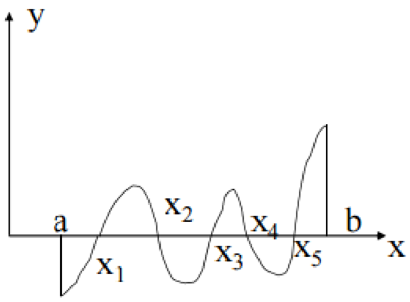
Root Finding: f(x)=0

Method 1: The Bisection method

Theorem: If f(x) is continuous in [a,b] and if f(a)f(b)<0, then there is atleast one root of f(x)=0 in (a,b).



Single root in (a,b)



Multiple roots in (a,b)

Example:

Consider finding the root of f(x) = x^2 - 3. Let εstep = 0.01, εabs = 0.01 and start with the interval [1, 2].

Bisection method applied to f(x) = x^2 - 3.

A	b	f(a)	f(b)	c = (a + b)/2	f(f)	Update	b - a
1	2	-2	1	1.5	-0.75	a = c	0.5
1.5	2	-0.75	1	1.75	0.062	b = c	0.25
1.5	1.75	-0.75	0.0625	1.625	-0.359	a = c	0.125
1.625	1.75	-0.3594	0.0625	1.6875	-0.1523	a = c	0.0625
1.6875	1.75	-0.1523	0.0625	1.7188	-0.0457	a = c	0.0313
1.7188	1.75	-0.0457	0.0625	1.7344	0.0081	b = c	0.0156
1.71988/td>	1.7344	-0.0457	0.0081	1.7266	-0.0189	a = c	0.0078