(14)

2. The false position method

This method is similar to the bisection method.
It requires two initial values a and b.

Algorithm steps :-

1. choose an interval $[a,b]$ such that
$f(a) * f(b) < 0$

2. Find (x_i) as an instantaneous root:-

$$x_i = \frac{a f(b) - b f(a)}{f(b) - f(a)}$$

3. Find and calculate $f(x_i)$ by using x_i-value

4. If $f(a) * f(x_i) < 0 \Rightarrow b = x_i$ and $f(b) = f(x_i)$
If $f(a) * f(x_i) > 0 \Rightarrow a = x_i$ and $f(a) = f(x_i)$

5. Repeat the above procedure starting from step (2) to calculate a new (x_i) ... and so on.

6. Terminate the calculations when the given accuracy condition is satisfied.

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Example Find approximate value of roots by using false position method of the following equation $f(x) = e^x - 3x$ in the interval $[1,2]$ and $\epsilon = 0.01$?

Solution :-

we have $a = 1$ and $b = 2$

$f(a) = f(1) = e^1 - 3(1) = 2.71 - 3 = -0.88$

$f(b) = f(2) = e^2 - 3(2) = 1.389$

$\therefore f(a) * f(b) < 0$

$\therefore$ there is a root in the interval $[1,2]$.

we have: $$x_i = \frac{a f(b) - b f(a)}{f(b) - f(a)}$$

i	a	b	$f(a)$	$f(b)$	x_i	$f(x_i)$	$f(a)*f(x_i)$
1	1	2	-0.281	1.389	1.169	-0.288	+
2	1.169	2	-0.288	1.389	1.311	-0.223	+
3	1.311	2	-0.223	1.389	1.406	-0.138	+
4	1.406	2	-0.138	1.389	1.459	-0.075	+
5	1.459	2	-0.075	1.389	1.486	-0.038	+
6	1.486	2	-0.038	1.389	1.499	-0.019	+
7	1.499	2	-0.019	1.389	1.505	-0.0108	+
8	1.505	2	-0.0108	1.389	1.502	-0.004	

$\therefore$ the root $\vec{x} \simeq 1.509$