Regula Falsi Method

Method of False Position

Let $f(x)=0$ be an equation,

To find the root of $f(x)=0$.

Working Formula

$$x_{n+1} = x_n - \frac{x_n - x_{n-1}}{f(x_n) - f(x_{n-1})} f(x_n)$$

$n = 1, 2, 3, \cdots$

STEPS

1) Find an initial interval which contains the root.

Condition : $f(a)\,f(b) < 0$.

Start finding the following values.

$f(0), f(1), f(2), \cdots$

$\cdots, f(-3), f(-2), f(-1), f(0)$

Stop whenever you have, for two consequtive integer $f(a)\,f(b) < 0$.

∴ Initial Interval : $[a, b]$.

Ex. 5. Find the root of the equation $xe^x - 3 = 0$ that lies between 1 and 2, correct to 4 significant figure using the method of False position.

Solution. Let $f(x) = xe^x - 3$

Here we choose $x_0 = 1, x_1 = 2$ so that $f(x_0) = -0.2817$,

$f(x_1) = 11.7781$

2) Look at the working formula.

You have the values that are required initially.

Draw the following table:

n	x_{n-1}	x_n	$f(x_{n-1})$	$f(x_n)$	$x_{n+1}=$	$f(x_{n+1})$
1	$x_0=a$	$x_1=b$	$f(a)$	$f(b)$	$x_2=$	

3) After one complete iteration, check the following :

If $f(x_{n-1})\, f(x_{n+1}) < 0$

The root lies between $[x_{n-1}, x_{n+1}]$.

So, No change in x_{n-1}

x_n will be replaced by x_{n+1}

Continue with the process

If $f(x_n)\, f(x_{n+1}) < 0$

The root lies between $[x_{n+1}, x_n]$

So x_{n-1} will be replaced by x_{n+1}

No change in x_n

Continue with the process.

No of iteration (n)	x_{n-1} $(f(x_{n-1})<0)$	x_n $(f(x_n)>0)$	$f(x_{n-1})$	$f(x_n)$	x_{n+1}	$f(x_{n+1})$
1	1	2	–0.2817	11.7781	1.02336	–0.15247
2	1.02336	2	–0.15247	11.7781	1.03584	–0.08155
3	1.03584	2	–0.08155	11.7781	1.04247	–0.04333
4	1.04247	2	–0.04333	11.7781	1.04598	–0.02295
5	1.04598	2	–0.02295	11.7781	1.04802	–0.01105
6	1.04802	2	–0.01105	11.7781	1.04891	

Thus the required root correct to four significant figure is 1.049.

4) Stop when for two consequtive iteratio
we have desired accuracy.