8.	2·09375	2·10156 25	-0·0089 4165039	0·07856 2259	2·09765 625	0·03471 428157	f(x0)*f(x1) <0
9.	2·09375	2·09765 625	-0·0089 4165039	0·03471 428157	2·095 703125	0·0128 623217	f(x0)*f(x1) <0
10.	2·09375	2·09570 3125	-0·0089 4165039	0·01286 233217	2·0947 6563	0·00195 34782	f(x0)*f(x1) <0
11.	2·09375	2·09472 6563	-0·0089 4165039	0·00195 43782	2·0942 38282	-0·0034 931464	f(x0)*f(x2) <0

Hence, the reqd. root of given eqn is 2·094.

4th dec 3. Find the root of eqn $\cos x = xe^x$ using the bisection method.

correct upto 4 decimals places.

soln

let $f(x) = \cos x - xe^x$

x		
f(x)		

- calculator ma:

(f(x_1)) $A = \cos(B) - Be^{B}$: (B → x_1)

↳ garne ALPHA use garera eqn banaune

(f(x_2)) $C = \cos(D) - De^{D}$: (D → x_2)

(x_0) $E = (B+D) \div 2$:

(f(x_0)) $F = \cos(E) - Ee^{E}$

↳ yesle join garera sab sangai lekhne

i.e.

$A = \cos(B) - Be^{B} : C = \cos(D) - De^{D} : E = B + D \div 2 : F = \cos(E) - Ee^{E}$

↓

Then calc thichne

Agadi ko table bata select ko

$x_1 = B$
$x_2 = D$ halne

ignore aru

& note ans values

0 1

x1 x2

Iteration	x_1	x_2	$f(x_1)$	$f(x_2)$	x_0	$f(x_0)$
1	0	1	1	-2.17	0.5	0.0532
2	0.5	1	0.0532	-2.17	0.75	-0.8560
3	0.5	0.75	0.0532	-0.8560	0.625	-0.35669
4	0.5	0.625	0.0532	-0.35669	0.5625	-0.14129
5	0.5	0.5625	0.0532	-0.14129	0.53125	-0.04151
6	0.5	0.53125	0.0532	-0.04151	0.515625	0.00647
7	0.515625	0.53125	0.00647	-0.04151	0.5234375	-0.017362
8	0.515625	0.5234375	0.00647	-0.017362	0.51953125	-0.005404
9	0.515625	0.51953125	0.00647	-0.005404	0.517578125	0.0005451
10	0.517578125	0.51953125	0.0005451	-0.005404	0.518554 6875	-0.0024271
11	0.517578125	0.518554 6875	0.0005451	-0.0024271	0.518066 4063	-0.000940
12	0.517578125	0.518066 4063	0.0005451	-0.000940	0.5178222657	-0.000197

13.	0·51757 8125	0·517822 657	0·00054	−0·000197	0·5177 001954	0·000017
14.	0·5177 001954	0·517822 657	0·0001739	−0·000197	0·5177 612306	−0·000011

Here, the reqd. root of the given eqn $\cos x - xe^x$ is 0·5177612306

∴ **Note:** At least 4 or 5 digits samma line

0.5137612306 $\times 10_{10}$

$\times 10_{10} x = 1.2$

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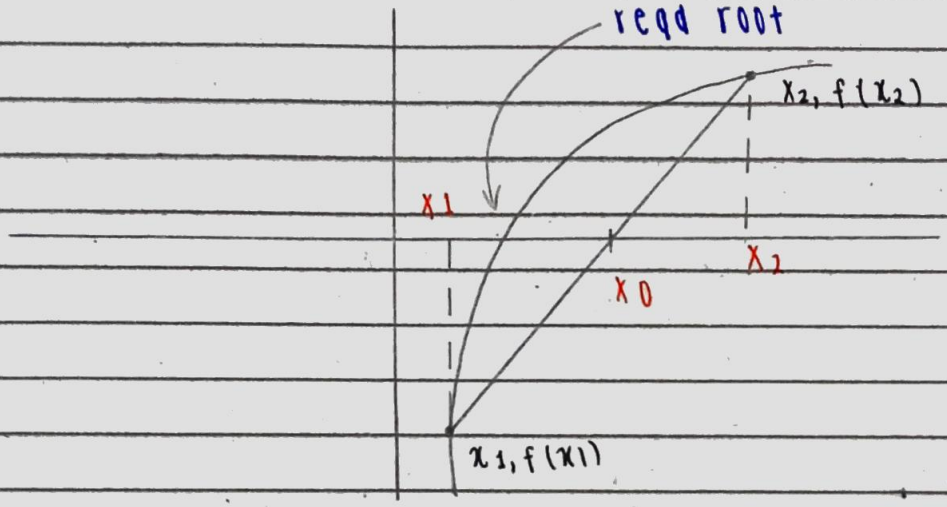
(ii) False position method / Falsi method / Regula Falsi method



Here,

let us join the point x_1 & x_2 by a st. line, the point x_0 where it cuts x-axis gives the improved estimation.

This is called **false position** of root.

- For formula

Eqⁿ of line joining the points $(x_1, f(x_1))$ (y_1) & $(x_2, f(x_2))$ (y_2) is:

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$$

$$\text{or, } y - f(x_1) = \frac{f(x_2) - f(x_1)}{x_2 - x_1}(x - x_1)$$

$\therefore$ The line cuts the x-axis at x_0.

When, $x = x_0$

$y = 0$

$$\text{or, } 0 - f(x_1) = \frac{f(x_2) - f(x_1)}{x_2 - x_1}(x_0 - x_1)$$

$$\text{or, } -f(x_1) = \frac{f(x_2) - f(x_1)}{x_2 - x_1}(x_0 - x_1)$$

$$\text{or, } \frac{-f(x_1)}{(x_0 - x_1)} = \frac{f(x_2) - f(x_1)}{x_2 - x_1}$$

$$\text{or, } x_0 - x_1 = \frac{-f(x_1) \cdot (x_2 - x_1)}{f(x_2) - f(x_1)}$$

$$\therefore x_0 = x_1 - \frac{f(x_1) \cdot (x_2 - x_1)}{f(x_2) - f(x_1)}$$

$x \log_{10} x = 1.2$ using late periods

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