

Then,  $-1 = -x^2$   
or,  $(x - \dots)$   
or,  $\dots$

4.	3.06988 7609	3.075273 986	-0.006576	0.00005 445	3.0752297 48
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$\therefore$  The reqd. root of eqn is 3.075229748

8. Find real root of given eqn  $x^3 + x^2 - 1 = 0$ .  
using Fixed Point Iteration method.

Given,

$$x^3 + x^2 - 1 = 0$$

$$\text{or, } x^3 + x^2 = 1$$

$$\text{or, } x^2(x+1) = 1$$

$$\text{or, } x^2 = \frac{1}{x+1}$$

$$\therefore x = \left( \frac{1}{x+1} \right)^{1/2}$$

Then,

Assume  $x_0 = 1$

$$x_1 = 0.7071067812$$

$$x_2 = 0.7653668647$$

$$x_3 = 0.752651743$$

$$x_4 = 0.7553611894$$

$$x_5 = 0.7547736916$$

$$x_6 = 0.7549000301$$

$$x_7 = 0.7548728563$$

$$x_8 = 0.7548787008$$

$$x_9 = 0.7548774437$$



(2) Newton  
 $0.6241845$

(3) Bisection  $\rightarrow 2.9576365$

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4. Using Regula-Falsi method, compute the real root of given eqn & correct upto 3 decimal places  
 $3x + \sin x = e^x$

### Regula-Falsi method

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

Given,

$$f(x) = 3x + \sin x - e^x$$

Iteration	$x_1$	$x_2$	$f(x_1)$	$f(x_2)$	$x_0$	$f(x_0)$
1.	0	1	-1	1.1231	0.47098	0.265
					95946	1588
2.	0	0.4709895	-1	0.265	0.372277	0.029
		946		1588	0522	53
3.	0	0.372277	-1	0.029	0.36159	0.0029
		0522		53	7744	91
4.	0	0.36159	-1	0.0029	0.36053	0.0002
		7744		91	74035	894
5.	0	0.36053	-1	0.00028	0.36043	0.0000
		74035		94	30764	2845

$\therefore$  The reqd. root the eqn is 0.3604330764.



5. Find root of eqn  $x \log_{10} x - \sin x = 1.2$  using bisection method.

Soln

Given,

$$f(x) = x \log_{10} x - \sin x - 1.2$$

**Bisection method**

$$x_0 = \frac{x_1 + x_2}{2}$$

Then,

Iteration	$x_1$	$x_2$	$f(x_1)$	$f(x_2)$	$x_0$	$f(x_0)$
1.	2	3	-1.507	0.0902	2.5	-0.8036
2.	2.5	3	-0.8036	0.0902	2.75	-0.3734
3.	2.75	3	-0.3734	0.0902	2.875	-0.144
4.	2.875	3	-0.144	0.0902	2.9375	-0.027
5.	2.9375	3	-0.02799	0.0902	2.96875	0.03096
6.	2.9375	2.96875	-0.02799	0.0309	2.953125	0.00144
7.	2.9375	2.953125	-0.02799	0.00144	2.9453125	-0.01328
8.	2.9453125	2.953125	-0.01328	0.00144	2.94921875	-0.0050



secant  $x_3 = x_2 - f(x_2)$

$f'(x_1)$

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9.	2.94921875	2.953125	-0.0059	0.00144	2.951171 875	-0.0022
10.	2.951171875	2.953125	-0.00223	0.00144	2.95214 8438	-0.00039 53
11.	2.952148438	2.953125	-0.00039	0.00144	2.95263 6719	0.00052 58
12.	2.952148438	2.952636719	-0.00039	0.00052	2.95239 2578	0.00066 52
13.	2.952148438	2.9523925 78	-0.00039	0.00066 52	2.952270 508	-0.0001 650
14.	2.952270508	2.9523925 78	-0.0001 650	0.00066 52	2.95233 1543	-0.0000 499
15.	2.95233 1543	2.9523925 78	-0.0000 499	0.00066 52	2.95236 2061	0.0000 07657

∴ The reqd. root of given eqn is 2.952362061



6. Using N-R method, find the true root of  $\cos x = 1.3x$  correct to 6 decimal places.

### Newton Raphson method

$$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)}$$

Given,

$$f(x) = \cos x - 1.3x$$

$$f'(x) = -\sin x - 1.3$$

$x$	0	1
$f(x)$	1	-0.759

Let us take  $x_1 = 0$  for a true root

Iteration	$x_1$	$f(x_1)$	$f'(x_1)$	$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)}$
1.	0	1	-1.3	0.7692307692
2.	0.7692307692	-0.28155	-1.9955	0.6281421333
3.	0.6281421333	-0.00746	-1.8876	0.6241879378
4.	0.6241879378	-0.000006331	-1.8844	0.6241845778



5.  $0.6241845778$   
 $778$   
 $-4.5799$   
 $\times 10^{-12}$   
 $-1.88493$   
 $0.6241845778$

$\therefore$  The reqd. root of given eqn is  $0.6241845778$

7. Find a real root of given eqn  $\cos x + 1.3x - 3 = 0$  using secant method & correct upto 3 decimal places

**secant method**

$$x_3 = x_2 - \frac{f(x_2) * (x_2 - x_1)}{f(x_2) - f(x_1)}$$

$x_1$  replaced  $x_2$

$x_2$  replaced  $x_3$

Iteration	$x_1$	$x_2$	$f(x_1)$	$f(x_2)$	$x_3 = x_2 - \frac{f(x_2) * (x_2 - x_1)}{f(x_2) - f(x_1)}$
1.	3	4	-0.089	1.5463	3.054995911
2.	4	3.054995911	1.5463	-0.02475	3.069887609
3.	3.054995911	3.069887609	-0.2475	-0.0065	3.075273986



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or,  $\dots$

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using Fixed Point Iteration method.

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