

03

WEDNESDAY
WK 01 DAY 003/3632024
JANUARY

N - 1

(Newton's method)

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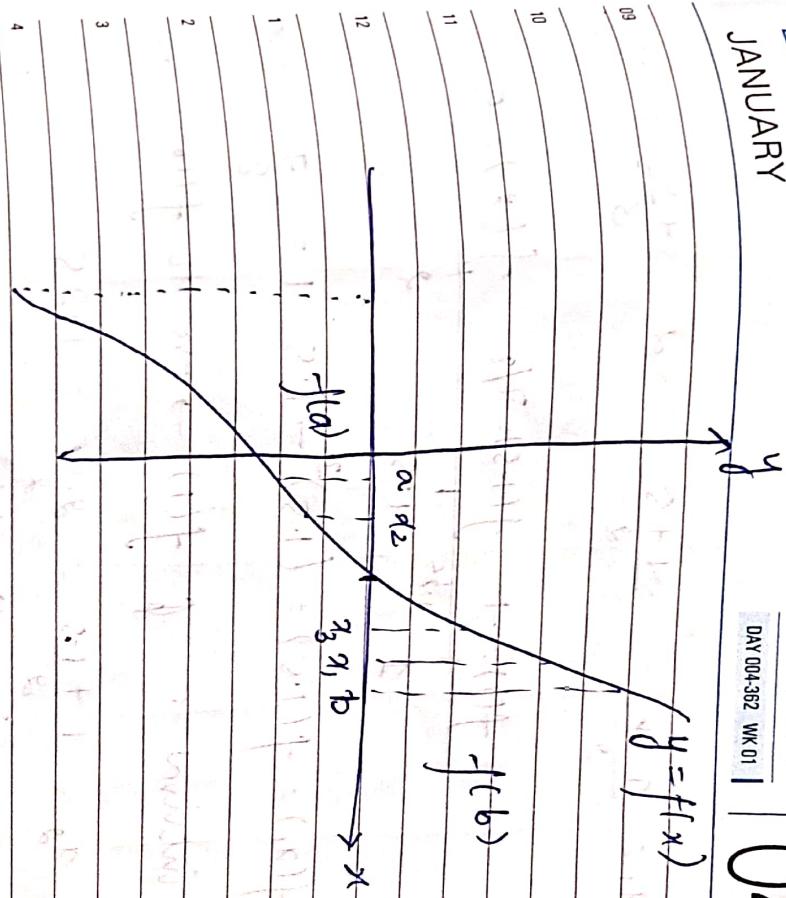
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2024
JANUARYTHURSDAY
DAY 004/362 WK 01

04



Then, we bisect the interval as before & continue the process until the root is found accurately.

Otherwise, the root lies b/w $a \& x_1$, or $x_1 \& b$, according to $f(x_1)$, if positive or negative.

Let $f(-1) = -1 + 1 - 1 = -1 = \text{ve}$

and $f(2) = 8 - 2 - 1 = 5 = \text{+ve}$

∴ $f(-1) \cdot f(2) = -1 \cdot 5 = \text{ve}$

∴ $f(x) = x^3 - x - 1 = 0$

∴ $x_1 = \frac{-1 + 2}{2} = \frac{1}{2}$

∴ $f(\frac{1}{2}) = (\frac{1}{2})^3 - \frac{1}{2} - 1 = -\frac{11}{8} = \text{ve}$

∴ $x_2 = \frac{\frac{1}{2} + 2}{2} = \frac{5}{4}$

∴ $f(\frac{5}{4}) = (\frac{5}{4})^3 - \frac{5}{4} - 1 = \frac{117}{64} = \text{+ve}$

∴ $x_3 = \frac{\frac{5}{4} + 2}{2} = \frac{13}{8}$

∴ $f(\frac{13}{8}) = (\frac{13}{8})^3 - \frac{13}{8} - 1 = \frac{133}{64} = \text{+ve}$

∴ $x_4 = \frac{\frac{13}{8} + 2}{2} = \frac{29}{16}$

∴ $f(\frac{29}{16}) = (\frac{29}{16})^3 - \frac{29}{16} - 1 = \frac{293}{128} = \text{+ve}$

∴ $x_5 = \frac{\frac{29}{16} + 2}{2} = \frac{65}{32}$

∴ $f(\frac{65}{32}) = (\frac{65}{32})^3 - \frac{65}{32} - 1 = \frac{653}{256} = \text{+ve}$

∴ $x_6 = \frac{\frac{65}{32} + 2}{2} = \frac{129}{64}$

∴ $f(\frac{129}{64}) = (\frac{129}{64})^3 - \frac{129}{64} - 1 = \frac{1293}{4096} = \text{+ve}$

∴ $x_7 = \frac{\frac{129}{64} + 2}{2} = \frac{265}{128}$

∴ $f(\frac{265}{128}) = (\frac{265}{128})^3 - \frac{265}{128} - 1 = \frac{2653}{16384} = \text{+ve}$

∴ $x_8 = \frac{\frac{265}{128} + 2}{2} = \frac{533}{256}$

∴ $f(\frac{533}{256}) = (\frac{533}{256})^3 - \frac{533}{256} - 1 = \frac{5333}{65536} = \text{+ve}$

∴ $x_9 = \frac{\frac{533}{256} + 2}{2} = \frac{1069}{512}$

∴ $f(\frac{1069}{512}) = (\frac{1069}{512})^3 - \frac{1069}{512} - 1 = \frac{10693}{131072} = \text{+ve}$

∴ $x_{10} = \frac{\frac{1069}{512} + 2}{2} = \frac{2137}{1024}$

∴ $f(\frac{2137}{1024}) = (\frac{2137}{1024})^3 - \frac{2137}{1024} - 1 = \frac{21373}{327680} = \text{+ve}$

∴ $x_{11} = \frac{\frac{2137}{1024} + 2}{2} = \frac{4275}{2048}$

∴ $f(\frac{4275}{2048}) = (\frac{4275}{2048})^3 - \frac{4275}{2048} - 1 = \frac{42753}{655360} = \text{+ve}$

∴ $x_{12} = \frac{\frac{4275}{2048} + 2}{2} = \frac{8551}{4096}$

∴ $f(\frac{8551}{4096}) = (\frac{8551}{4096})^3 - \frac{8551}{4096} - 1 = \frac{85513}{1310720} = \text{+ve}$

∴ $x_{13} = \frac{\frac{8551}{4096} + 2}{2} = \frac{17103}{8192}$

∴ $f(\frac{17103}{8192}) = (\frac{17103}{8192})^3 - \frac{17103}{8192} - 1 = \frac{171033}{2621440} = \text{+ve}$

∴ $x_{14} = \frac{\frac{17103}{8192} + 2}{2} = \frac{34207}{16384}$

∴ $f(\frac{34207}{16384}) = (\frac{34207}{16384})^3 - \frac{34207}{16384} - 1 = \frac{342073}{5242880} = \text{+ve}$

∴ $x_{15} = \frac{\frac{34207}{16384} + 2}{2} = \frac{68415}{32768}$

∴ $f(\frac{68415}{32768}) = (\frac{68415}{32768})^3 - \frac{68415}{32768} - 1 = \frac{684153}{10485760} = \text{+ve}$

∴ $x_{16} = \frac{\frac{68415}{32768} + 2}{2} = \frac{136831}{65536}$

∴ $f(\frac{136831}{65536}) = (\frac{136831}{65536})^3 - \frac{136831}{65536} - 1 = \frac{1368313}{20971520} = \text{+ve}$

∴ $x_{17} = \frac{\frac{136831}{65536} + 2}{2} = \frac{273663}{131072}$

∴ $f(\frac{273663}{131072}) = (\frac{273663}{131072})^3 - \frac{273663}{131072} - 1 = \frac{2736633}{41943040} = \text{+ve}$

∴ $x_{18} = \frac{\frac{273663}{131072} + 2}{2} = \frac{547327}{65536}$

∴ $f(\frac{547327}{65536}) = (\frac{547327}{65536})^3 - \frac{547327}{65536} - 1 = \frac{5473273}{20971520} = \text{+ve}$

∴ $x_{19} = \frac{\frac{547327}{65536} + 2}{2} = \frac{1094655}{131072}$

∴ $f(\frac{1094655}{131072}) = (\frac{1094655}{131072})^3 - \frac{1094655}{131072} - 1 = \frac{10946553}{41943040} = \text{+ve}$

∴ $x_{20} = \frac{\frac{1094655}{131072} + 2}{2} = \frac{2189311}{65536}$

∴ $f(\frac{2189311}{65536}) = (\frac{2189311}{65536})^3 - \frac{2189311}{65536} - 1 = \frac{21893113}{20971520} = \text{+ve}$

∴ $x_{21} = \frac{\frac{2189311}{65536} + 2}{2} = \frac{4378623}{131072}$

∴ $f(\frac{4378623}{131072}) = (\frac{4378623}{131072})^3 - \frac{4378623}{131072} - 1 = \frac{43786233}{41943040} = \text{+ve}$

∴ $x_{22} = \frac{\frac{4378623}{131072} + 2}{2} = \frac{8757247}{65536}$

∴ $f(\frac{8757247}{65536}) = (\frac{8757247}{65536})^3 - \frac{8757247}{65536} - 1 = \frac{87572473}{20971520} = \text{+ve}$

∴ $x_{23} = \frac{\frac{8757247}{65536} + 2}{2} = \frac{17514495}{131072}$

∴ $f(\frac{17514495}{131072}) = (\frac{17514495}{131072})^3 - \frac{17514495}{131072} - 1 = \frac{175144953}{41943040} = \text{+ve}$

∴ $x_{24} = \frac{\frac{17514495}{131072} + 2}{2} = \frac{35028991}{65536}$

∴ $f(\frac{35028991}{65536}) = (\frac{35028991}{65536})^3 - \frac{35028991}{65536} - 1 = \frac{350289913}{20971520} = \text{+ve}$

∴ $x_{25} = \frac{\frac{35028991}{65536} + 2}{2} = \frac{70057983}{131072}$

∴ $f(\frac{70057983}{131072}) = (\frac{70057983}{131072})^3 - \frac{70057983}{131072} - 1 = \frac{700579833}{41943040} = \text{+ve}$

∴ $x_{26} = \frac{\frac{70057983}{131072} + 2}{2} = \frac{140115967}{65536}$

∴ $f(\frac{140115967}{65536}) = (\frac{140115967}{65536})^3 - \frac{140115967}{65536} - 1 = \frac{1401159673}{20971520} = \text{+ve}$

∴ $x_{27} = \frac{\frac{140115967}{65536} + 2}{2} = \frac{280231935}{131072}$

∴ $f(\frac{280231935}{131072}) = (\frac{280231935}{131072})^3 - \frac{280231935}{131072} - 1 = \frac{2802319353}{41943040} = \text{+ve}$

∴ $x_{28} = \frac{\frac{280231935}{131072} + 2}{2} = \frac{560463871}{65536}$

∴ $f(\frac{560463871}{65536}) = (\frac{560463871}{65536})^3 - \frac{560463871}{65536} - 1 = \frac{5604638713}{20971520} = \text{+ve}$

∴ $x_{29} = \frac{\frac{560463871}{65536} + 2}{2} = \frac{1120927743}{131072}$

∴ $f(\frac{1120927743}{131072}) = (\frac{1120927743}{131072})^3 - \frac{1120927743}{131072} - 1 = \frac{11209277433}{41943040} = \text{+ve}$

∴ $x_{30} = \frac{\frac{1120927743}{131072} + 2}{2} = \frac{2241855487}{65536}$

∴ $f(\frac{2241855487}{65536}) = (\frac{2241855487}{65536})^3 - \frac{2241855487}{65536} - 1 = \frac{22418554873}{20971520} = \text{+ve}$

∴ $x_{31} = \frac{\frac{2241855487}{65536} + 2}{2} = \frac{4483710975}{131072}$

∴ $f(\frac{4483710975}{131072}) = (\frac{4483710975}{131072})^3 - \frac{4483710975}{131072} - 1 = \frac{44837109753}{41943040} = \text{+ve}$

∴ $x_{32} = \frac{\frac{4483710975}{131072} + 2}{2} = \frac{8967421951}{65536}$

∴ $f(\frac{8967421951}{65536}) = (\frac{8967421951}{65536})^3 - \frac{8967421951}{65536} - 1 = \frac{89674219513}{20971520} = \text{+ve}$

∴ $x_{33} = \frac{\frac{8967421951}{65536} + 2}{2} = \frac{17934843903}{131072}$

∴ $f(\frac{17934843903}{131072}) = (\frac{17934843903}{131072})^3 - \frac{17934843903}{131072} - 1 = \frac{179348439033}{41943040} = \text{+ve}$

∴ $x_{34} = \frac{\frac{17934843903}{131072} + 2}{2} = \frac{35869687807}{65536}$

∴ $f(\frac{35869687807}{65536}) = (\frac{35869687807}{65536})^3 - \frac{35869687807}{65536} - 1 = \frac{358696878073}{20971520} = \text{+ve}$

∴ $x_{35} = \frac{\frac{35869687807}{65536} + 2}{2} = \frac{71739375615}{131072}$

∴ $f(\frac{71739375615}{131072}) = (\frac{71739375615}{131072})^3 - \frac{71739375615}{131072} - 1 = \frac{717393756153}{41943040} = \text{+ve}$

∴ $x_{36} = \frac{\frac{71739375615}{131072} + 2}{2} = \frac{143478751231}{65536}$

∴ $f(\frac{143478751231}{65536}) = (\frac{143478751231}{65536})^3 - \frac{143478751231}{65536} - 1 = \frac{1434787512313}{20971520} = \text{+ve}$

∴ $x_{37} = \frac{\frac{143478751231}{65536} + 2}{2} = \frac{286957502463}{131072}$

∴ $f(\frac{286957502463}{131072}) = (\frac{286957502463}{131072})^3 - \frac{286957502463}{131072} - 1 = \frac$

05

FRIDAY
WEEK DAY (05-30)JANUARY
2024

- Q. $x_1 = \frac{a+b}{2} = \frac{-1+5}{2} = -1$ and $\frac{1+2}{3} = 1.5$
10. $f(1) = -1$ $f(1.5) = 1.5$. $f(2) = 5$
11. $1 \quad 1.25 \quad 1.5 \quad 2$
12. $f(x_1) = f(1.5) = (1.5)^3 - 1.5 - 1 = \frac{7}{8} = +ve$
13. interval :- $f(1) \rightarrow -ve$ to $f(1.5) = +ve$
14. $x_2 = \frac{1+1.5}{2} = 1.25$
15. it will lie b/w 1 & 1.5.
16. $f(1.25) = (1.25)^3 - (1.25) - 1$
 $= \frac{-19}{64} = -ve.$
17. interval :- 1.25 to 1.5
18. $x_3 = \frac{1.25+1.5}{2} = 1.375$

JANUARY
2024SATURDAY
WEEKEND

06

$$\text{Q. Find the real roots of the eqn}$$

$$f(x) = x^3 - 2x - 5 = 0$$

$$\Rightarrow f(0) = 0 - 0 - 5 = -5 = -ve$$

$$f(1) = 1 - 2 - 5 = -6 = -ve$$

$$f(2) = 8 - 4 - 5 = -1 = -ve$$

$$f(3) = 27 - 6 - 5 = 16 = +ve$$

3 intervals.

$$\text{Ans} \quad a = 2 \quad \text{as} \quad f(a) = +ve$$

$$b = 3 \quad \text{as} \quad f(b) = -ve$$

JANUARY 2024						
WK	M	T	W	T	F	S
1	1	2	3	4	5	6
2	8	9	10	11	12	13
3	15	16	17	18	19	20
4	22	23	24	25	26	27
5	29	30	31			

FEBRUARY 2024						
WK	M	T	W	T	F	S
1	5	6	7	8	9	10
2	12	13	14	15	16	17
3	19	20	21	22	23	24
4	26	27	28	29		



07

SUNDAY
WK 01 DAY 007-359

x	a	b	$x = \frac{a+b}{2}$	$f(x)$
11	a	b	$x_1 = \frac{2+3}{2} = 2.5$	$f(2.5) = 5.625$
12	a	2.5	2.25	$+1.8906$
13	a	2.25	2.125	$+0.3457$
14	a	2.125	-0.3513	$f(-0.3513) = 0.1668$
15	2.0625	2.125	2.09375	-0.0089
16	2.09375	2.125	2.10938	-0.10938
17	2.10938	2.125	2.11743	-0.00342
18	2.11743	2.125	2.12125	-0.00125
19	2.12125	2.125	2.12313	-0.000313
20	2.12313	2.125	2.12438	-0.000138
21	2.12438	2.125	2.12488	-0.0000488
22	2.12488	2.125	2.125	-0.00001
23	2.125	2.125	2.125	-0.000005

2024

JANUARY
MONDAY
DAY 008-358 WK 02

08

JANUARY
DAY 008-358 WK 02

JANUARY 2024						
WEEK	M	T	W	T	F	S
1	1	2	3	4	5	6
2	8	9	10	11	12	13
3	15	16	17	18	19	20
4	22	23	24	25	26	27
5	29	30	31			

JANUARY
MONDAY
DAY 008-358 WK 02

$$f(2.0625) = \frac{2+2.0625}{2} = 2.0313$$

$$x_2 = \frac{2+2.0313}{2} = 2.01668$$

$$f(2.0313) = \frac{2+2.0313}{2} = 2.01743$$

$$x_3 = \frac{2+2.01743}{2} = 2.01438$$

$$f(2.01743) = \frac{2+2.01743}{2} = 2.01213$$

$$x_4 = \frac{2+2.01213}{2} = 2.00668$$

$$f(2.00668) = \frac{2+2.00668}{2} = 2.00338$$

$$x_5 = \frac{2+2.00338}{2} = 2.00188$$

$$f(2.00188) = \frac{2+2.00188}{2} = 2.00093$$

$$x_6 = \frac{2+2.00093}{2} = 2.000465$$

$$f(2.000465) = \frac{2+2.000465}{2} = 2.0002325$$

$$x_7 = \frac{2+2.0002325}{2} = 2.00011625$$

$$f(2.00011625) = \frac{2+2.00011625}{2} = 2.00006$$

$$x_8 = \frac{2+2.00006}{2} = 2.00003$$

$$f(2.00003) = \frac{2+2.00003}{2} = 2.000015$$

$$x_9 = \frac{2+2.000015}{2} = 2.0000075$$

$$f(2.0000075) = \frac{2+2.0000075}{2} = 2.00000375$$

$$x_{10} = \frac{2+2.00000375}{2} = 2.000001875$$

$$f(2.000001875) = \frac{2+2.000001875}{2} = 2.0000009375$$

$$x_{11} = \frac{2+2.0000009375}{2} = 2.00000046875$$

$$f(2.00000046875) = \frac{2+2.00000046875}{2} = 2.000000234375$$

$$x_{12} = \frac{2+2.000000234375}{2} = 2.0000001171875$$

$$f(2.0000001171875) = \frac{2+2.0000001171875}{2} = 2.00000005859375$$

$$x_{13} = \frac{2+2.00000005859375}{2} = 2.000000029296875$$

$$f(2.000000029296875) = \frac{2+2.000000029296875}{2} = 2.0000000146484375$$

$$x_{14} = \frac{2+2.0000000146484375}{2} = 2.00000000732421875$$

$$f(2.00000000732421875) = \frac{2+2.00000000732421875}{2} = 2.000000003662109375$$

$$x_{15} = \frac{2+2.000000003662109375}{2} = 2.0000000018310546875$$

$$f(2.0000000018310546875) = \frac{2+2.0000000018310546875}{2} = 2.00000000091552734375$$

$$x_{16} = \frac{2+2.00000000091552734375}{2} = 2.000000000457763671875$$

$$f(2.000000000457763671875) = \frac{2+2.000000000457763671875}{2} = 2.000000000228881859375$$

$$x_{17} = \frac{2+2.000000000228881859375}{2} = 2.0000000001144409296875$$

$$f(2.0000000001144409296875) = \frac{2+2.0000000001144409296875}{2} = 2.00000000005722046484375$$

$$x_{18} = \frac{2+2.00000000005722046484375}{2} = 2.000000000028610222421875$$

$$f(2.000000000028610222421875) = \frac{2+2.000000000028610222421875}{2} = 2.0000000000143051112109375$$

$$x_{19} = \frac{2+2.0000000000143051112109375}{2} = 2.00000000000715255560546875$$

$$f(2.00000000000715255560546875) = \frac{2+2.00000000000715255560546875}{2} = 2.000000000003576277802734375$$

$$x_{20} = \frac{2+2.000000000003576277802734375}{2} = 2.0000000000017881389013671875$$

$$f(2.0000000000017881389013671875) = \frac{2+2.0000000000017881389013671875}{2} = 2.000000000000894069450684375$$

$$x_{21} = \frac{2+2.000000000000894069450684375}{2} = 2.0000000000004470347253421875$$

$$f(2.0000000000004470347253421875) = \frac{2+2.0000000000004470347253421875}{2} = 2.00000000000022351786267109375$$

$$x_{22} = \frac{2+2.00000000000022351786267109375}{2} = 2.000000000000111758931345546875$$

$$f(2.000000000000111758931345546875) = \frac{2+2.000000000000111758931345546875}{2} = 2.0000000000000558794656727734375$$

$$x_{23} = \frac{2+2.0000000000000558794656727734375}{2} = 2.00000000000002793973284138671875$$

$$f(2.00000000000002793973284138671875) = \frac{2+2.00000000000002793973284138671875}{2} = 2.0000000000000139698664206934375$$

$$x_{24} = \frac{2+2.0000000000000139698664206934375}{2} = 2.00000000000000697993321034671875$$

$$f(2.00000000000000697993321034671875) = \frac{2+2.00000000000000697993321034671875}{2} = 2.00000000000000348976660517334375$$

$$x_{25} = \frac{2+2.00000000000000348976660517334375}{2} = 2.000000000000001744983302586671875$$

$$f(2.000000000000001744983302586671875) = \frac{2+2.000000000000001744983302586671875}{2} = 2.00000000000000087249165129334375$$

$$x_{26} = \frac{2+2.00000000000000087249165129334375}{2} = 2.000000000000000436245825646671875$$

$$f(2.000000000000000436245825646671875) = \frac{2+2.000000000000000436245825646671875}{2} = 2.00000000000000021812291282334375$$

$$x_{27} = \frac{2+2.00000000000000021812291282334375}{2} = 2.000000000000000109061456411671875$$

$$f(2.000000000000000109061456411671875) = \frac{2+2.000000000000000109061456411671875}{2} = 2.000000000000000054530728205859375$$

$$x_{28} = \frac{2+2.000000000000000054530728205859375}{2} = 2.0000000000000000272653641029296875$$

$$f(2.0000000000000000272653641029296875) = \frac{2+2.0000000000000000272653641029296875}{2} = 2.00000000000000001363268205146484375$$

$$x_{29} = \frac{2+2.00000000000000001363268205146484375}{2} = 2.000000000000000006816341025732421875$$

$$f(2.000000000000000006816341025732421875) = \frac{2+2.000000000000000006816341025732421875}{2} = 2.0000000000000000034081705128662109375$$

$$x_{30} = \frac{2+2.0000000000000000034081705128662109375}{2} = 2.00000000000000000170408525643310546875$$

$$f(2.00000000000000000170408525643310546875) = \frac{2+2.00000000000000000170408525643310546875}{2} = 2.000000000000000000852042628216552734375$$

$$x_{31} = \frac{2+2.000000000000000000852042628216552734375}{2} = 2.0000000000000000004260213141082763671875$$

$$f(2.0000000000000000004260213141082763671875) = \frac{2+2.0000000000000000004260213141082763671875}{2} = 2.000000000000000000213010657054138184375$$

$$x_{32} = \frac{2+2.000000000000000000213010657054138184375}{2} = 2.0000000000000000001065053285270690921875$$

$$f(2.0000000000000000001065053285270690921875) = \frac{2+2.0000000000000000001065053285270690921875}{2} = 2.00000000000000000005325266426353454609375$$

$$x_{33} = \frac{2+2.00000000000000000005325266426353454609375}{2} = 2.000000000000000000026626332131767273046875$$

$$f(2.000000000000000000026626332131767273046875) = \frac{2+2.000000000000000000026626332131767273046875}{2} = 2.0000000000000000000133131660658836365234375$$

$$x_{34} = \frac{2+2.0000000000000000000133131660658836365234375}{2} = 2.00000000000000000000665658303294471821875$$

$$f(2.00000000000000000000665658303294471821875) = \frac{2+2.00000000000000000000665658303294471821875}{2} = 2.000000000000000000003328291516472359109375$$

$$x_{35} = \frac{2+2.000000000000000000003328291516472359109375}{2} = 2.0000000000000000000016641457582361795546875$$

$$f(2.0000000000000000000016641457582361795546875) = \frac{2+2.0000000000000000000016641457582361795546875}{2} = 2.00000000000000000000083207287911808977281875$$

$$x_{36} = \frac{2+2.00000000000000000000083207287911808977281875}{2} = 2.0000000000000000000004160364395590448864375$$

$$f(2.0000000000000000000004160364395590448864375) = \frac{2+2.0000000000000000000004160364395590448864375}{2} = 2.00000000000000000000020801821977952244321875$$

$$x_{37} = \frac{2+2.00000000000000000000020801821977952244321875}{2} = 2.0000000000000000000001040091098897612216375$$

$$f(2.0000000000000000000001040091098897612216375) = \frac{2+2.0000000000000000000001040091098897612216375}{2} = 2.00000000000000000000005200455499448061081875$$

$$x_{38} = \frac{2+2.00000000000000000000005200455499448061081875}{2} = 2.000000000000000000000026002277497240305409375$$

$$f(2.000000000000000000000026002277497240305409375) = \frac{2+2.000000000000000000000026002277497240305409375}{2} = 2.0000000000000000000000130011$$

09

TUESDAY
WK 02 DAY 009-357JANUARY
2024JANUARY
2024WEDNESDAY
DAY 010-356 WK 02

10

* False Position method (Regula Falsi)

$$\text{Root} \rightarrow A(a, f(a))$$

$$f(a)$$

$$R$$

$$c(c, 0)$$

$$b$$

$$x$$

$$f(b)$$

11 | THURSDAY
WK 02 DAY 01/13/2024

JANUARY
2024

12

JANUARY
2024

FRIDAY
DAY 01/13/2024 WK 02

1st iteration:

$$9 \rightarrow a = 2, b = 3.$$

$$\Rightarrow f(a) = 1, f(b) = 16$$

$$10 \quad c = \frac{af(b) - bf(a)}{f(b) - f(a)} = \frac{2(16) - 3(-1)}{16 - (-1)}$$

$$11 \quad = \frac{32 + 3}{17} = \frac{35}{17} = 2.0588$$

$$12 \quad = \frac{32 + 3}{17} = \frac{35}{17} = 2.0588$$

$$13 \quad f(c) = (2.0588)^3 - 2(2.0588) - 5 = -0.3908 < 0$$

2nd iteration

$$14 \quad a = 2.0588 \Rightarrow f(a) = -0.3908$$

$$15 \quad b = 3 \Rightarrow f(b) = 16.$$

$$16 \quad c = \frac{2.0588(16) + 3(-0.3908)}{16 - (-0.3908)}$$

$$17 \quad = \frac{32 + 0.3908}{16 + 0.3908}$$

$$18 \quad = 2.0812$$

$$19 \quad f(c) = (2.0812)^3 - 2(2.0812) - 5 = -0.1479 < 0$$

3rd iteration

$$20 \quad a = 2.0812 \Rightarrow f(a) = -0.1479$$

$$21 \quad b = 3 \Rightarrow f(b) = 16.$$

$$22 \quad c = \frac{2.0812(16) + 3(-0.1479)}{16 - (-0.1479)} = 2.0896$$

$$23 \quad = \frac{32 + 0.1479}{16 + 0.1479}$$

$$24 \quad = 2.0896$$

$$25 \quad f(c) = -0.0551 < 0$$

4th iteration

$$26 \quad a = 2.0896 \Rightarrow f(a) = -0.0551$$

$$27 \quad b = 3 \Rightarrow f(b) = 16.$$

$$28 \quad c = \frac{2.0896(16) + 3(-0.0551)}{16 - (-0.0551)} = 2.0927$$

$$29 \quad = \frac{32 + 0.0551}{16 + 0.0551}$$

$$30 \quad = 2.0927$$

$$31 \quad f(c) = -0.002 < 0$$

Q. Using false-position method, find a real root of the eqn

$$x \log_{10} x - 1.2 = 0 \text{ in 3 steps}$$

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3	15	16	17	18	19	20
4	22	23	24	25	26	27
5	29	30	31			

FEBRUARY 2024						
WEEK	M	T	W	T	F	S
1	5			1	2	3
2	6	7	8	9	10	11
3	13	14	15	16	17	18
4	20	21	22	23	24	25
5	27	28	29			



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WEEK 02 DAY 013-353

JANUARY
2024

JANUARY
2024

SUNDAY
DAY 014-352 WK 02

14

$$f(1) = 2 \log_{10} 2 - 1 \cdot 2 = -1 \cdot 2 < 0$$

$$f(2) = 2 \log_{10} 2 - 1 \cdot 2 = -0 \cdot 6 < 0$$

$$f(3) = 3 \log_{10} 3 - 1 \cdot 2 = 0 \cdot 23 > 0.$$

$$\begin{aligned} a &= 2 & f(a) &= -0 \cdot 6 \\ b &= 3 & f(b) &= 0 \cdot 23. \end{aligned}$$

1st iteration

$$a = 2 \quad \Rightarrow \quad f(a) = -0 \cdot 6$$

$$b = 3 \quad \Rightarrow \quad f(b) = 0 \cdot 23$$

$$c = \frac{2(0 \cdot 23) + 3(-0 \cdot 6)}{0 \cdot 23 + 0 \cdot 6} = 0 \cdot 46 + 1 \cdot 8$$

$$= \frac{0 \cdot 23 + 0 \cdot 6}{0 \cdot 83} = 2 \cdot 729$$

$$f(c) = -0 \cdot 0186 < 0.$$

2nd iteration

$$\begin{aligned} a &= 2 \cdot 729 & f(a) &= -0 \cdot 0186 \\ b &= 3 & f(b) &= 0 \cdot 23 \end{aligned}$$

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WK	M	T	W	T	F	S
1	1	2	3	4	5	6
2	8	9	10	11	12	13
3	15	16	17	18	19	20
4	22	23	24	25	26	27
5	29	30	31			

WK	M	T	W	T	F	S
5						
6	5	6	7	8	9	10
7	12	13	14	15	16	17
8	19	20	21	22	23	24
9	26	27	28	29		

* Simple Fixed Point Iteration method -

Suppose we have eqⁿ $f(x) = 0$, then
¹⁰ eqⁿ can be expressed as $x = \phi(x)$.

$$\left. \begin{array}{l} |\phi'(x)| < 1 \\ \text{at } x = x_0 \end{array} \right\}$$

Then iterative method is applied.

The successive approximation is given by

$$\left. \begin{array}{l} x_n = \phi(x_{n-1}) \\ \dots \end{array} \right\}$$

$$x_1 = \phi(x_0)$$

$$x_2 = \phi(x_1)$$

$$x_3 = \phi(x_2)$$

$$x_n = \phi(x_{n-1})$$

Q. Find a real root of the eqn :-
 ~~$f(x) = x^3 + x^2 - 1 = 0$~~

$$\rightarrow f(0) = 0 + 0 - 1 = -1$$

$$f(1) = 1 + 1 - 1 = 1$$

$$\text{Let } x_0 = 0.5 \quad (\frac{0+1}{2} = 0.5)$$

$$\phi(x) = x \quad \text{can be written in 3 ways -}$$

$$\left. \begin{array}{l} x^3 = 1 - x^2 \\ x = (1 - x^2)^{1/3} \end{array} \right\} \quad \left. \begin{array}{l} x^2 = 1 - x^3 \\ x = (1 - x^3)^{1/2} \end{array} \right\} \quad \left. \begin{array}{l} x^2(x+1)-1=0 \\ x = \frac{1}{\sqrt{1+x}} \end{array} \right\}$$

$$\left. \begin{array}{l} \phi(x) = (1 - x^2)^{1/3} \\ \phi'(x) = \frac{1}{3} (-2x) \end{array} \right\}$$

$$\left. \begin{array}{l} \phi'(x) = \frac{1}{3} (-2x) \\ x = 0.5 \end{array} \right\}$$

$$\left. \begin{array}{l} \phi'(x) \\ x = 0.5 \end{array} \right\}$$

$$\left. \begin{array}{l} \phi'(x) \\ x = 0.5 \end{array} \right\}$$

$$\left. \begin{array}{l} \phi'(x) \\ x = 0.5 \end{array} \right\}$$

JANUARY 2024						
WEEK	M	T	W	T	F	S
1	1	2	3	4	5	6
2	8	9	10	11	12	13
3	15	16	17	18	19	20
4	22	23	24	25	26	27
5	29	30	31			

FEBRUARY 2024						
WEEK	M	T	W	T	F	S
5				1	2	3
6	6	7	8	9	10	11
7	13	14	15	16	17	18
8	20	21	22	23	24	25
9	27	28	29			

THURSDAY

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$$x_n = \frac{1}{\sqrt{1+x_{n-1}}}$$

Now,

9) $x_1 = \frac{1}{\sqrt{1+x_0}} = \frac{1}{\sqrt{1+0.5}} = \frac{1}{\sqrt{1.5}}$

10) $\phi(x) = x = (1-x^2)^{1/3}$

11) $\phi'(x) = \frac{1}{3} \frac{(2x)}{(1-x^2)^{2/3}}$

12) $\left| \phi'(x) \right|_{x=x_0} = \left| \phi'(x) \right|_{x=0.5} = \frac{1}{3} \left(2 \left(\frac{1}{2} \right) \right)$

13) $= \frac{1}{3} \cdot \frac{1}{(0.75)^{0.66}} = \frac{1}{3} \left(\frac{1}{0.824} \right)$

14) $= \frac{1}{2 \cdot 481} = 0.403 < 1.$

15) $x = (1-x_3)^{1/2} \quad \& \quad x = \frac{1}{\sqrt{1+x_3}}$ be like

16) $\left| \phi'(x) \right|_{x=0.5} < 1$

But, we'll consider $\phi(x) = \frac{1}{\sqrt{1+x}}$ because it leads to a value less than 0.

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JANUARY

17) WEDNESDAY
WK 03 DAY 017-349
 $x^3 = 1-x^2 \Rightarrow x = (1-x^2)^{1/3}$

18) $\phi(x) = x = (1-x^2)^{1/3}$

19) $\phi'(x) = \frac{1}{3} \frac{(2x)}{(1-x^2)^{2/3}}$

20) $\left| \phi'(x) \right|_{x=x_0} = \left| \phi'(x) \right|_{x=0.5} = \frac{1}{3} \left(2 \left(\frac{1}{2} \right) \right)$

21) $= \frac{1}{3} \cdot \frac{1}{(0.75)^{0.66}} = \frac{1}{3} \left(\frac{1}{0.824} \right)$

22) $= \frac{1}{2 \cdot 481} = 0.403 < 1.$

23) $x_3 = \frac{1}{\sqrt{1+x_2}} = \frac{1}{\sqrt{1+0.74196}} = \frac{1}{\sqrt{1.74196}} = 0.74196$

24) $x_4 = \frac{1}{\sqrt{1+x_3}} = \frac{1}{\sqrt{1+0.75427}} = 0.75427$

25) $x_5 = \frac{1}{\sqrt{1+x_4}} = \frac{1}{\sqrt{1+0.75488}} = 0.75488$

26) $x_6 = \frac{1}{\sqrt{1+x_5}} = 0.75488$

27) $x_7 = 0.75488$ same digit stop.

JANUARY 2024						
WK	M	T	W	T	F	S
1	1	2	3	4	5	6
2	8	9	10	11	12	13
3	15	16	17	18	19	20
4	22	23	24	25	26	27
5	29	30	31			

FEBRUARY 2024						
WK	M	T	W	T	F	S
5		1	2	3	4	
6	5	6	7	8	9	10
7	12	13	14	15	16	17
8	19	20	21	22	23	24
9	26	27	28	29		



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FRIDAY
WK 03 DAY 019/347JANUARY
2024

Q. Find the root of $\cos x = 3x - 1$, correct to four decimal places by using iteration method.

$$\rightarrow f(x) = \cos x - 3x + 1$$

$$\begin{aligned} f(0) &= 1 - 0 + 1 = 2 > 0 \quad \text{is increasing} \\ f\left(\frac{\pi}{2}\right) &= 0 - \frac{3\pi}{2} + 1 < 0. \quad \text{as compare to } \frac{\pi}{2}. \end{aligned}$$

$$\text{Let } x_0 = 0 \rightarrow \text{2nd step now.}$$

$$\begin{aligned} 3x &= 1 + \cos x \\ x &= \frac{1 + \cos x}{3} \Rightarrow \phi(x) = \frac{1 + \cos x}{3}. \end{aligned}$$

$$\Rightarrow \phi'(x) \Big|_{x=0} = \frac{\sin 0}{3} = 0. < 1$$

$$\begin{aligned} \text{To find value } 0 + \frac{\pi}{2} \Rightarrow \frac{\pi}{4} \text{ but it is} \\ \text{the bs } |\phi'(x)| \Big|_{x=x_0} < 1 \text{ Anna change} \end{aligned}$$

2024
JANUARYSATURDAY
DAY 020/346 WK 03

20

$$\Rightarrow x_n = \phi(x_{n-1})$$

$$\begin{aligned} x_1 &= \frac{1 + \cos x_0}{3} = \frac{1 + \cos 0}{3} = \frac{2}{3} = 0.66667 \\ &\approx 0.66667 \end{aligned}$$

$$\begin{aligned} x_2 &= \frac{1 + \cos(0.66667)}{3} = \frac{1 + 0.99993}{3} = 0.66664 \\ &\approx 0.66664 \end{aligned}$$

$$\begin{aligned} x_3 &= \frac{1 + \cos(0.66664)}{3} = \frac{1 + 0.999993}{3} \\ &= 0.666644 \\ &\approx 0.666644 \end{aligned}$$

$$\Rightarrow \text{root is } 0.666644.$$

JANUARY 2024

WEEK	M	T	W	T	F	S
1	1	2	3	4	5	6
2	8	9	10	11	12	13
3	15	16	17	18	19	20
4	22	23	24	25	26	27
5	29	30	31			

FEBRUARY 2024

WEEK	M	T	W	T	F	S
5			1	2	3	4
6	5	6	7	8	9	10
7	12	13	14	15	16	17
8	19	20	21	22	23	24
9	26	27	28	29		



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SUNDAY
JANUARY
2024

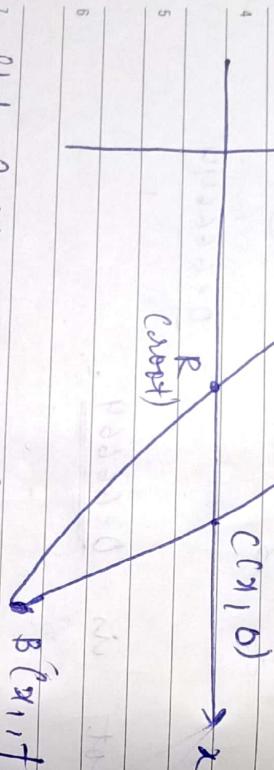
* Secant method (Chord method) -

This method is quite similar to regular false position method except for the word "regular".

$$f(x_0)f(x_1) < 0$$

$$A(x_0, f(x_0))$$

$$B(x_1, f(x_1))$$

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In solving, we get,

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

General form,

$$x_{n+2} = \frac{x_n f(x_{n+1}) - x_{n+1} f(x_n)}{f(x_{n+1}) - f(x_n)}$$

Thus method fails when

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

Q. A real root of the eqn $x^3 - 5x + 1 = 0$ lies in the interval $(0, 1)$. Perform four iterations of the secant method.

$$\rightarrow \text{s.t. } f(1) = 1^3 - 5 \cdot 1 + 1$$

$$f(0) = 0 - 0 + 1 = 1$$

$$f(1) = 1 - 5 + 1 = -3$$

$$x_0 = 0, x_1 = 1, f(1) = -3$$

$$f(x_0)f(x_1) < 0$$

$$\frac{0 - (-3)}{1 - 0} = 3$$

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MONDAY
JANUARY
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JANUARY 2024						
WEEK	M	T	W	T	F	S
1	1	2	3	4	5	6
2	8	9	10	11	12	13
3	15	16	17	18	19	20
4	22	23	24	25	26	27
5	29	30	31			

FEBRUARY 2024						
WEEK	M	T	W	T	F	S
5			1	2	3	4
6	5	6	7	8	9	10
7	12	13	14	15	16	17
8	19	20	21	22	23	24
9	26	27	28	29		

23

TUESDAY
WK 04 DAY 023/343Put $x_{n+1} =$

$$x_{n-1} f(x_n) - x_n f(x_{n-1})$$

$$\text{Put } n = 1 \text{ (yukki 01 already hai)}$$

$$x_2 = x_0 f(x_1) - x_1 f(x_0) = \frac{0(-3)}{-3} - \frac{1(1)}{1}.$$

$$f(x_1) - f(x_0) = \frac{1}{4} = 0.25$$

$$f(0.25) = -0.234375.$$

$$\text{Put } n = 2.$$

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

$$= \frac{1(-0.234375) - 0.25(-3)}{-0.234375 + 3} = 0.18644$$

$$f(x_2) = 0.07428$$

28 Root is 0.20081

Put $n = 3$

$$x_4 = \frac{x_3 f(x_3) - x_3 f(x_2)}{f(x_3) - f(x_2)}$$

$$= \frac{0.25(0.07428) - 0.18644(-0.234375)}{0.07428 + 0.18644}.$$

$$f(0.25) = 0.20174$$

$$f(x_3) = -0.00048$$

$$\text{Put } n = 4$$

$$x_5 = \frac{x_4 f(x_4) - x_4 f(x_3)}{f(x_4) - f(x_3)}$$

$$= \frac{0.18644(-0.00048) - 0.20174(0.07428)}{-0.00048 - 0.07428}$$

$$= 0.20081$$

28 Root is 0.20081

Put $n = 5$

$$x_6 = \frac{x_5 f(x_5) - x_5 f(x_4)}{f(x_5) - f(x_4)}$$

$$= \frac{0.20174(-0.20081) - 0.18644(-0.00048)}{0.20081 + 0.18644}.$$

$$f(0.20174) = 0.20081$$

$$f(x_5) = 0.20081$$

$$\text{Put } n = 6$$

$$x_7 = \frac{x_6 f(x_6) - x_6 f(x_5)}{f(x_6) - f(x_5)}$$

$$= \frac{0.18644(-0.20081) - 0.20174(-0.00048)}{-0.20081 - (-0.00048)}$$

$$= 0.19999$$

28 Root is 0.19999

Put $n = 7$

$$x_8 = \frac{x_7 f(x_7) - x_7 f(x_6)}{f(x_7) - f(x_6)}$$

$$= \frac{0.19999(-0.19999) - 0.18644(-0.00048)}{0.19999 + 0.00048}.$$

$$f(0.19999) = 0.19999$$

$$f(x_7) = 0.19999$$

$$\text{Put } n = 8$$

$$x_9 = \frac{x_8 f(x_8) - x_8 f(x_7)}{f(x_8) - f(x_7)}$$

$$= \frac{0.18644(-0.19999) - 0.19999(-0.00048)}{-0.19999 - (-0.00048)}$$

$$= 0.19999$$

28 Root is 0.19999

Put $n = 9$

$$x_{10} = \frac{x_9 f(x_9) - x_9 f(x_8)}{f(x_9) - f(x_8)}$$

$$= \frac{0.19999(-0.19999) - 0.18644(-0.00048)}{0.19999 + 0.00048}.$$

$$f(0.19999) = 0.19999$$

$$f(x_8) = 0.19999$$

$$\text{Put } n = 10$$

$$x_{11} = \frac{x_{10} f(x_{10}) - x_{10} f(x_9)}{f(x_{10}) - f(x_9)}$$

$$= \frac{0.18644(-0.19999) - 0.19999(-0.00048)}{-0.19999 - (-0.00048)}$$

$$= 0.19999$$

28 Root is 0.19999

Put $n = 11$

$$x_{12} = \frac{x_{11} f(x_{11}) - x_{11} f(x_{10})}{f(x_{11}) - f(x_{10})}$$

$$= \frac{0.19999(-0.19999) - 0.18644(-0.00048)}{0.19999 + 0.00048}.$$

$$f(0.19999) = 0.19999$$

$$f(x_{10}) = 0.19999$$

$$\text{Put } n = 12$$

$$x_{13} = \frac{x_{12} f(x_{12}) - x_{12} f(x_{11})}{f(x_{12}) - f(x_{11})}$$

$$= \frac{0.18644(-0.19999) - 0.19999(-0.00048)}{-0.19999 - (-0.00048)}$$

$$= 0.19999$$

28 Root is 0.19999

Put $n = 13$

$$x_{14} = \frac{x_{13} f(x_{13}) - x_{13} f(x_{12})}{f(x_{13}) - f(x_{12})}$$

$$= \frac{0.19999(-0.19999) - 0.18644(-0.00048)}{0.19999 + 0.00048}.$$

$$f(0.19999) = 0.19999$$

$$f(x_{12}) = 0.19999$$

$$\text{Put } n = 14$$

$$x_{15} = \frac{x_{14} f(x_{14}) - x_{14} f(x_{13})}{f(x_{14}) - f(x_{13})}$$

$$= \frac{0.18644(-0.19999) - 0.19999(-0.00048)}{-0.19999 - (-0.00048)}$$

$$= 0.19999$$

28 Root is 0.19999

Put $n = 15$

$$x_{16} = \frac{x_{15} f(x_{15}) - x_{15} f(x_{14})}{f(x_{15}) - f(x_{14})}$$

$$= \frac{0.19999(-0.19999) - 0.18644(-0.00048)}{0.19999 + 0.00048}.$$

$$f(0.19999) = 0.19999$$

$$f(x_{14}) = 0.19999$$

$$\text{Put } n = 16$$

$$x_{17} = \frac{x_{16} f(x_{16}) - x_{16} f(x_{15})}{f(x_{16}) - f(x_{15})}$$

$$= \frac{0.18644(-0.19999) - 0.19999(-0.00048)}{-0.19999 - (-0.00048)}$$

$$= 0.19999$$

28 Root is 0.19999

Put $n = 17$

$$x_{18} = \frac{x_{17} f(x_{17}) - x_{17} f(x_{16})}{f(x_{17}) - f(x_{16})}$$

$$= \frac{0.19999(-0.19999) - 0.18644(-0.00048)}{0.19999 + 0.00048}.$$

$$f(0.19999) = 0.19999$$

$$f(x_{16}) = 0.19999$$

$$\text{Put } n = 18$$

$$x_{19} = \frac{x_{18} f(x_{18}) - x_{18} f(x_{17})}{f(x_{18}) - f(x_{17})}$$

$$= \frac{0.18644(-0.19999) - 0.19999(-0.00048)}{-0.19999 - (-0.00048)}$$

$$= 0.19999$$

28 Root is 0.19999

Put $n = 19$

$$x_{20} = \frac{x_{19} f(x_{19}) - x_{19} f(x_{18})}{f(x_{19}) - f(x_{18})}$$

$$= \frac{0.19999(-0.19999) - 0.18644(-0.00048)}{0.19999 + 0.00048}.$$

$$f(0.19999) = 0.19999$$

$$f(x_{18}) = 0.19999$$

$$\text{Put } n = 20$$

$$x_{21} = \frac{x_{20} f(x_{20}) - x_{20} f(x_{19})}{f(x_{20}) - f(x_{19})}$$

$$= \frac{0.18644(-0.19999) - 0.19999(-0.00048)}{-0.19999 - (-0.00048)}$$

$$= 0.19999$$

28 Root is 0.19999

Put $n = 21$

$$x_{22} = \frac{x_{21} f(x_{21}) - x_{21} f(x_{20})}{f(x_{21}) - f(x_{20})}$$

$$= \frac{0.19999(-0.19999) - 0.18644(-0.00048)}{0.19999 + 0.00048}.$$

$$f(0.19999) = 0.19999$$

$$f(x_{20}) = 0.19999$$

$$\text{Put } n = 22$$

$$x_{23} = \frac{x_{22} f(x_{22}) - x_{22} f(x_{21})}{f(x_{22}) - f(x_{21})}$$

$$= \frac{0.18644(-0.19999) - 0.19999(-0.00048)}{-0.19999 - (-0.00048)}$$

$$= 0.19999$$

28 Root is 0.19999

Put $n = 23$

$$x_{24} = \frac{x_{23} f(x_{23}) - x_{23} f(x_{22})}{f(x_{23}) - f(x_{22})}$$

$$= \frac{0.19999(-0.19999) - 0.18644(-0.00048)}{0.19999 + 0.00048}.$$

$$f(0.19999) = 0.19999$$

$$f(x_{22}) = 0.19999$$

$$\text{Put } n = 24$$

$$x_{25} = \frac{x_{24} f(x_{24}) - x_{24} f(x_{23})}{f(x_{24}) - f(x_{23})}$$

$$= \frac{0.18644(-0.19999) - 0.19999(-0.00048)}{-0.19999 - (-0.00048)}$$

$$= 0.19999$$

28 Root is 0.19999

Put $n = 25$

$$x_{26} = \frac{x_{25} f(x_{25}) - x_{25} f(x_{24})}{f(x_{25}) - f(x_{24})}$$

$$= \frac{0.19999(-0.19999) - 0.18644(-0.00048)}{0.19999 + 0.00048}.$$

$$f(0.19999) = 0.19999$$

$$f(x_{24}) = 0.19999$$

$$\text{Put } n = 26$$

$$x_{27} = \frac{x_{26} f(x_{26}) - x_{26} f(x_{25})}{f(x_{26}) - f(x_{25})}$$

$$= \frac{0.18644(-0.19999) - 0.19999(-0.00048)}{-0.19999 - (-0.00048)}$$

$$= 0.19999$$

28 Root is 0.19999

Put $n = 27$

$$x_{28} = \frac{x_{27} f(x_{27}) - x_{27} f(x_{26})}{f(x_{27}) - f(x_{26})}$$

$$= \frac{0.19999(-0.19999) - 0.18644(-0.00048)}{0.19999 + 0.00048}.$$

$$f(0.19999) = 0.19999$$

$$f(x_{26}) = 0.19999$$

$$\text{Put } n = 28$$

$$x_{29} = \frac{x_{28} f(x_{28}) - x_{28} f(x_{27})}{f(x_{28}) - f(x_{27})}$$

$$= \frac{0.18644(-0.19999) - 0.19999(-0.00048)}{-0.19999 - (-0.00048)}$$

$$= 0.19999$$

28 Root is 0.19999

Put $n = 29$

$$x_{30} = \frac{x_{29} f(x_{29}) - x_{29} f(x_{28})}{f(x_{29}) - f(x_{28})}$$

$$= \frac{0.19999(-0.19999) - 0.18644(-0.00048)}{0.19999 + 0.00048}.$$

$$f(0.19999) = 0.19999$$

$$f(x_{28}) = 0.19999$$

$$\text{Put } n = 30$$

$$x_{31} = \frac{x_{30} f(x_{30}) - x_{30} f(x_{29})}{f(x_{30}) - f(x_{29})}$$

$$= \frac{0.18644(-0.19999) - 0.19999(-0.00048)}{-0.19999 - (-0.00048)}$$

$$= 0.19999$$

28 Root is 0.19999

Put $n = 31$

$$x_{32} = \frac{x_{31} f(x_{31}) - x_{31} f(x_{30})}{f(x_{32}) - f(x_{31})}$$

$$= \frac{0.19999(-0.19999) - 0.18644(-0.00048)}{0.19999 + 0.00048}.$$

$$f(0.19999) = 0.19999$$

$$f(x_{30}) = 0.19999$$

$$\text{Put } n = 32$$

$$x_{33} = \frac{x_{32} f(x_{32}) - x_{32} f(x_{31})}{f(x_{33}) - f(x_{32})}$$

$$= \frac{0.18644(-0.19999) - 0.19999(-0.00048)}{-0.19999 - (-0.00048)}$$

$$= 0.19999$$

28 Root is 0.19999

Put $n = 33$

$$x_{34} = \frac{x_{33} f(x_{33}) - x_{33} f(x_{32})}{f(x_{34}) - f(x_{33})}$$

$$= \frac{0.19999(-0.19999) - 0.18644(-0.00048)}{0.19999 + 0.00048}.$$

$$f(0.19999) = 0.19999$$

$$f(x_{32}) = 0.19999$$

$$\text{Put } n = 34$$

$$x_{35} = \frac{x_{34} f(x_{34}) - x_{34} f(x_{33})}{f(x_{35}) - f(x_{34})}$$

$$= \frac{0.18644(-0.19999) - 0.19999(-0.00048)}{-0.1$$

25 | THURSDAY
WK 04 DAY 025-341

JANUARY
2024

JANUARY
2024

Q. Estimate the root of the eqn $\cos x - x^e = 0$
using the secant method with initial
estimate of $x_1 = 0.5$, $x_2 = 1$.

$$\rightarrow f(x_1) = f(0.5) = \cos 0.5 - 0.5^e = 0.0532.$$

$$f(x_2) = f(1) = \cos 1 - 1^e = -0.1972$$

We know,

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

Put $n=2$

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

$$= \frac{0.5(-2.019798) - 1(0.0532)}{-2.19798 - 0.0532}$$

$$= 0.5119$$

$$\therefore f(x_3) = 0.019793$$

JANUARY 2024						
WEEK	M	T	W	T	F	S
1	1	2	3	4	5	6
2	8	9	10	11	12	13
3	15	16	17	18	19	20
4	22	23	24	25	26	27
5	29	30	31			

FRIDAY
DAY 026-340 WK 04

26

JANUARY
2024

In solving, we get root at $n=5 \Rightarrow x_6 = 0.5178$.

* Newton Raphson Method -

$$y - y_1 = \frac{dy}{dx} (x - x_1)$$

here, $x_1 = x_0$ & $y_1 = f(x_0)$

$$y - f(x_0) = f'(x_0)(x - x_0) \quad \text{--- Tangent.}$$

pt. $(x_1, 0)$ satisfies ①

$$\therefore 0 - f(x_0) = f'(x_0)(x_1 - x_0)$$

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

$$\therefore x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} \quad \rightarrow \text{Formula of Newton Raphson}$$

FEBRUARY 2024						
WEEK	M	T	W	T	F	S
1	1	2	3	4	5	6
2	8	9	10	11	12	13
3	15	16	17	18	19	20
4	22	23	24	25	26	27
5	29	30	31			



27

SATURDAY
WK 04 DAY 02/7/3392024
JANUARY2024
JANUARYSUNDAY
DAY 02/8/339 WK 04 | 28

$$\boxed{x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}} \quad \text{General formula}$$

Q. Find by Newton Raphson method a root of $\cos x - x e^x = 0$.

$$x_1 = 3 - 3x - 5 = 0$$

$$\Rightarrow f(0) = 0 - 0 - 5 = -5$$

$$\begin{aligned} f'(2) &= 8 - 6 - 5 = -2 \\ f'(3) &= 27 - 9 - 5 = 16 = +ve. \end{aligned}$$

$x - 3$ is near to 0 $\Rightarrow \boxed{x_0 = 2}$

$$\text{Now, } x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$$

Put $x = 0$

$$\Rightarrow x_1 = 2 - \frac{f(2)}{f'(2)}$$

so on. until value of x repeats.

$$\begin{aligned} x_1 &= 2 - \frac{f(2)}{f'(2)} \\ f'(2) &= 3x^2 - 3 \Rightarrow f'(x_1) = 3(2 + 3.3333)^2 - 3 \end{aligned}$$

$$\begin{aligned} f'(x_0) &= -3, \quad f'(x_0) = 3x^2 - 3 \\ &= 3(4) - 3 = 9. \end{aligned}$$

JANUARY 2024

FEBRUARY 2024

JANUARY 2024						
WEEK	M	T	W	T	F	S
1	1	2	3	4	5	6
2	8	9	10	11	12	13
3	15	16	17	18	19	20
4	22	23	24	25	26	27
5	29	30	31			

FEBRUARY 2024						
WEEK	M	T	W	T	F	S
5					1	2
6	5	6	7	8	9	10
7	12	13	14	15	16	17
8	19	20	21	22	23	24
9	26	27	28	29		

$$\begin{aligned} x_1 &= 2 - \frac{f(2)}{f'(2)} \\ f'(2) &= 3(2 + 3.3333)^2 - 3 \\ &= \dots \end{aligned}$$

Q. Use Newton Raphson method to find a real root of $\cos x - x e^x = 0$ correct to four decimal places.



29

MONDAY
WK 05 DAY 028/337

JANUARY 2024

$$\Rightarrow \cos x - x e^x = f(x)$$

$$10 f(1) = \cos 1 - 1e^1 = -2.07182$$

$$11 f(0) = 1.$$

12 ~~$\log_{10} x$~~ Transcendental eqn we take mid pt

$$1 \Delta x_0 = \frac{1+0}{2} = 0.5$$

$$2 f'(x) = -\sin x - e^x - xe^x \\ 3 = -\sin x - e^x(x+1)$$

$$4 x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$$

$$5 x_1 = 0.5 - \frac{\cos(0.5) - 0.5e^{0.5}}{\sin(0.5) - e^{0.5}(0.5+1)}$$

$$6 = 0.51802$$

$$7 x_2 = 0.51802 - \frac{\cos(0.51802) - 0.51802e^{0.51802}}{-\sin(0.51802) - e^{0.51802}(0.51802)}$$

= 0.5180 → repeats.

8 $\sqrt{R_{00t}} = \underline{\underline{0.5180}}$

JANUARY 2024

WEEK	M	T	W	T	F	S
1	1	2	3	4	5	6
2	8	9	10	11	12	13
3	15	16	17	18	19	20
4	22	23	24	25	26	27
5	29	30	31			

2024 | JANUARY 30

TUESDAY | DAY 030/336 WK 05

JANUARY 2024

f. Apply Newton Raphson method to solve

$$2(x-3) = \log_{10} x \Rightarrow 2(x-3) - \log_{10} x = 0$$

$$11 \rightarrow f(1) = 2(1-3) - 0 = 2(-2) = -4$$

$$12 f(3) = 2(3) - 0.301 = -2.301$$

$$1 f(4) = 2 - 0.4771 = -0.4771$$

$$2 \Delta x_0 = \frac{3+4}{2} = \frac{7}{2} = 3.5$$

$$3 f'(x) = 2(1-x) - \frac{1}{x} = \frac{2-2x}{x}$$

$$4 x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$$

$$5 x_1 = 3.5 - \frac{\log(3.5) - 3.5}{2 - \frac{1}{3.5}} = 3.25696$$

FEBRUARY 2024

WEEK	M	T	W	T	F	S
1	5		6	7	8	9
2	6	5	6	7	8	9
3	7	12	13	14	15	16
4	8	13	14	15	16	17
5	15	20	21	22	23	24
6	22	27	28	29	30	31
7	26	27	28	29		



31

WEDNESDAY

JANUARY
2024

On calling

09 $x_2 = 3.256366.$

10 $x_3 = \underline{\underline{3.256}} \rightarrow \text{repeated}$

11 Root is $\underline{\underline{3.256}}$.

12 $(x^2 - 3.256^2) = (x^2 - 10.58)$

1 $x^2 = 10.58 + 3.256^2$

2 $x = \sqrt{10.58 + 3.256^2}$

3 $x = \sqrt{10.58 + 10.58} = \sqrt{21.16} = 4.6$

4 $x = 4.6$

5 $(x^2)^2 = 10.58$

6 $(x^2)^2 = 10.58$

7 $x^2 = 3.256366$

$x = \sqrt{3.256366} = 1.804466$



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