COMANDO GENERAL DEL EJERCITO
ESCUELA MILITAR DE INGENIERIA
"MCAL. ANTONIO JOSE DE SUCRE"
BOLIVIA

PRACTICA #3

"RAGLA FALSA Y PUNTO FIJO"

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PRACTICA.

1.- Regla falsa. $\ln^2 x - x - 1 = 0$ $[0.1; 0.5]$ EROR $\leq 0.5\%$.

$$x_r = \frac{af(b) - bf(a)}{f(b) - f(a)}$$

i	a	b	x_i	f(a)f(b)	Cambio	Error
1	0.1	0.5	0.42190	(+)(-)= -	b=0.42190	—
2	0.1	0.42190	0.37722	(+)(-)= -	b=0.37722	11.84%
3	0.1	0.37722	0.35166	(+)(-)= -	b=0.35166	7.2706
4	0.1	0.35166	0.33702	(+)(-)= -	b=0.33702	4.34%
5	0.1	0.33702	0.32863	(+)(-)= -	b=0.32863	2.55%.
6	0.1	0.32863	0.32382	(+)(+)= -	b=0.32382	0.5%
7						
8						
9						
10						
12						
12						
13						

$$E_1 = \frac{|0.37722 - 0.42190|}{0.37722} \times 100$$

$E_1 = 11.84$

Para x_1

$f(a) = 4.20190$
$f(b) = -1.01955$

$$x_1 = \frac{0.1(-1.01955) - 0.5(4.20190)}{(-1.01955) - (4.20190)}$$

$x_1 = 0.42190$

Para x_2

$f(a) = 4.20190$
$f(b) = -0.67715$

$$x_2 = \frac{0.1(-0.67715) - 0.42190(4.20190)}{(-0.67715) - (4.20190)}$$

$x_2 = 0.37722$

Para x_3

$f(a) = 4.20190$
$f(b) = -0.42674$

$$x_3 = \frac{0.1(-0.42674) - 0.37722(4.2019)}{(-0.42674) - (4.2019)}$$

$x_3 = 0.35166$

Para x_4

$f(a) = 4.2019$
$f(b) = -0.25945$

$$x_4 = \frac{0.1(-0.25945) - 0.35166(4.2019)}{-0.25945 - 4.2019}$$

$x_4 = 0.33702$

Para x_5

$f(a) = 4.2019$
$f(b) = -0.15412$

$$x_5 = \frac{0.1(-0.15412) - 0.33702(4.2019)}{(-0.15412) - 4.2019}$$

$x_5 = 0.32863$

Para x_6

$f(a) = 4.2019$
$f(b) = -0.09026$

$$x_6 = \frac{0.1(-0.09026) - 0.32863(4.2019)}{-0.09026 - 4.2019}$$

$x_6 = 0.32382$

Solución aproximada: $x \approx 0.32382$ //

2.- Regla falsa $f(x) = \sqrt{x} - \cos x$ $[0,3]$ 5 iteraciones.

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

i	a	b	x_i	$f(a)f(b)$	Cambio	Error
1	0	3	0.80601	$(-)(+)=-$	$b=0.80601$	——
2	0	0.80601	0.66867	$(-)(+)=-$	$b=0.66867$	20.54%
3	0	0.66867	0.64726	$(-)(+)=-$	$b=0.64726$	3.31%
4	0	0.64726	0.64289	$(-)(+)=-$	$b=0.64289$	0.68%
5	0	0.64289	0.64197	$(-)(+)=-$	$b=0.64197$	0.14%

Para x_1

$f(a) = -1$
$f(b) = 2.72204$

$$x_1 = \frac{0(2.72204) - 3(-1)}{2.72204 - (-1)}$$

$x_1 = 0.80601$

Para x_2

$f(a) = -1$
$f(b) = 0.20540$

$$x_2 = \frac{-0.80601(-1)}{0.20540 - (-1)}$$

$x_2 = 0.66867$

Para x_3

$f(a) = -1$
$f(b) = 0.03308$

$$x_3 = \frac{0(0.03308) - 0.66867(-1)}{0.03308 - (-1)}$$

$x_3 = 0.64726$

Para x_4

$f(a) = -1$
$f(b) = 0.00679$

$$x_4 = \frac{0(0.00679) - 0.64726(-1)}{0.00679 - (-1)}$$

$x_4 = 0.64289$

Para x_5

$f(a) = -1$
$f(b) = 0.00144$

$$x_5 = \frac{0(0.00144) - 0.64289(-1)}{0.00144 - (-1)}$$

$x_5 = 0.64197$

Raíz/Solución Aproximada
$x \approx 0.64197$ //

3.- $f(x) = \operatorname{sen} x - \operatorname{cosec} x + 1 = 0$ $[0.5, 0.7]$ 5 iteraciones.

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

j	a	b	x_i	f(a)f(b)	Cambio	Error
1	0.5	0.7	0.67367	(-)(+) = -	b = 0.67367	
2	0.5	0.67367	0.66788	(-)(+) = -	b = 0.66788	0.87%
3	0.5	0.66788	0.66660	(-)(+) = -	b = 0.66660	0.19%
4	0.5	0.66660	0.66632	(-)(+) = -	b = 0.66632	0.04%
5	0.5	0.66632	0.66626	(-)(+) = -	b = 0.66626	0.009%

Para x_1

$f(a) = -0.60640$
$f(b) = 0.09195$

$$x_1 = \frac{0.5(0.09195) - 0.7(-0.60640)}{0.09195 + (-0.60640)}$$

$x_1 = 0.67367$

Para x_2

$f(a) = -0.60640$
$f(b) = 0.02093$

$$x_2 = \frac{0.5(0.02093) - 0.67367(-0.60640)}{0.02093 - (-0.60640)}$$

$x_2 = 0.66788$

Para x_3

$f(a) = -0.60640$
$f(b) = 0.00466$

$$x_3 = \frac{0.5(0.00466) - 0.66788(-0.60640)}{0.00466 - (-0.60640)}$$

$x_3 = 0.66660$

Para x_4

$f(a) = -0.60640$
$f(b) = 0.00103$

$$x_4 = \frac{0.5(0.00103) - 0.6666(-0.60640)}{0.00103 - (-0.60640)}$$

$x_4 = 0.66632$

Para x_5

$f(a) = -0.6064$
$f(b) = 0.00023$

$$x_5 = \frac{0.5(0.00023) - 0.66632(-0.6064)}{0.00023 - (-0.6064)}$$

$x_5 = 0.66626$

Solucion Aproximada.

$x \approx 0.66626$ //

4.- Punto fijo $f(x) = \ln x + 2 - x$ $e = 1\cdot10^{-5} \approx 0.00001$

$\ln x + 2 - x = 0$

x	y
2	0.6931
3	0.0986
4	-0.613

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

$\boxed{x_0 = 3.5}$

① $x = \ln x + 2$

$g(x) = \ln x + 2$

$g'(x) = \frac{1}{x}$

$-1 < 0.28571 < 1$

apto

$x_1 = g(x_0)$ $x_1 = \ln(3.5) + 2$

$x_1 = 3.25276$

i	x_i	$g(x_i)$	Error
0	3.5	3.25276	
1	3.25276	3.17950	0.076
2	3.17950	3.15673	0.023
3	3.15673	3.14954	0.007
4	3.14954	3.14725	0.002
5	3.14725	3.14653	0.00073
6	3.14653	3.14630	0.00023
7	3.14630	3.14623	0.00007
8	3.14623	3.14620	0.00002
9	3.14620		0.00001

Raiz aproximada

$x \approx 3.14620$ //

5.- Punto fijo $f(x) = x^3 - e^x + 3 = 0$ 10 iter.

①

$x^3 + x - e^x + 3 = x$

$g(x) = x^3 + x - e^x + 3$

$g'(x) = 3x^2 + 1 - e^x$

$-1 < g'(4.5) < 1$ -> falso

$g'(4.5) = -28.28713$

x	y
3	9.9144
4	12.401
5	-20.41

$x_0 = \frac{4+5}{2} = \frac{9}{2} = 4.5$

$\boxed{x_0 = 4.5}$

②

$x^3 - e^x + 3 = 0$ $g(x) = \frac{e^x - 3}{x^2}$

$x^3 = e^x - 3$ $g'(x) = \frac{e^x(x^2) - (e^x - 3)(2x)}{x^4}$

$x = \frac{e^x - 3}{x^2}$

$-1 < g'(4.5) < 1$ -> falso

$g'(4.5) = 2.53545$

③ $e^x = x^3 + 3$

$x = \ln(x^3 + 3)$

$g(x) = \ln(x^3 + 3)$

$g'(x) = \frac{1}{x^3+3}(2x)$

$-1 < g'(4.5) < 1$ -> Verdadero

i	x_i	$f(x_i)$	Error
0	4.5	4.54462	
1	4.54462	4.57330	0.00627
2	4.57330	4.59158	0.00398
3	4.59158	4.60320	0.00252
4	4.60320	4.61055	0.00159
5	4.61055	4.61519	0.00101
6	4.61519	4.61812	0.00063
7	4.61812	4.61997	0.00052
8	4.61997	4.62113	0.00040
9	4.62113		0.00025

Raiz aproximada $x \approx 4.62113$ //

6.- Punto fijo. $x^2 - e^{2x} - 1 = 0$. 10 iter.

① $e^{2x} = x^2 - 1$

$2x = \ln(x^2-1)$

$x = \frac{\ln(x^2-1)}{2}$

$g(x) = \frac{\ln(x^2-1)}{2}$

$g'(x) = \frac{1}{\cancel{2}} \frac{1}{x^2-1}(\cancel{2}x) = \frac{x}{x^2-1}$

$-1 < g'(-1.05) < 1$ -> falso

$g'(-1.05) = -10.24390$

No apto

x	y
-1.2	0.3492
-1.1	0.991
-1	-0.135

$x_0 = \frac{-1.1 + (-1)}{2} = -1.05$

$x_0 = -1.05$ //

② $x^2 = e^{2x} + 1$

$|x| = \sqrt{e^{2x}+1}$

$x = \sqrt{e^{2x}+1}$

$x = -\sqrt{e^{2x}+1}$

$g(x) = -\sqrt{e^{2x}+1}$ ✓

$g_1(x) = \sqrt{e^{2x}+1}$

$g'(x) = -\frac{1}{\cancel{2}} \frac{1}{\sqrt{e^{2x}+1}}(\cancel{2}e^{2x})$

$g'(x) = -\frac{e^{2x}}{\sqrt{e^{2x}+1}} \Rightarrow g'(-1.05) = 0.11558$

$-1 < 0.11558 < -1$ -> Verdadero

apto

i	x_i	$g(x_i)$	Error%
0	-1.05	-1.05946	
1	-1.05946	-1.05838	0.89%
2	-1.05838	-1.05850	0.10%
3	-1.05850	-1.05849	0.01%
4	-1.05849	-1.05849	0.00001%
5	-1.05849	-1.05849	0%
6	-1.05849	-1.05849	0%
7	-1.05849	-1.05849	0%
8	-1.05849	-1.05849	0%
9	-1.05849		0%

Raiz aproximada

$x \approx -1.05849$ //