ESCUELA POLITÉCNICA NACIONAL
FACULTAD DE INGENIERÍA DE SISTEMAS
INGENIERÍA EN CIENCIAS DE LA COMPUTACIÓN

PERÍODO ACADÉMICO: 2025-A
ASIGNATURA: ICCD412 Métodos Numéricos **GRUPO:** GR2
TIPO DE INSTRUMENTO: Tarea3
FECHA DE ENTREGA LÍMITE: 04/05/2025
ALUMNO: Sebastián Chicaiza

TEMA

Método de la bisección

OBJETIVOS

- Poner en practica el método de la bisección.
- Implemetar el método de la bisección como algoritmo y entender su funcionamiento.

DESARROLLO

Codificación

Listing 1: Algoritmo de Bisección en Python

```
#Paso 1
i = 1
FA = evaluar(limiteInferior)
```

```
#Paso 2
while i <= numeroIteraciones:
    print(f"Limite Inferior:{limiteInferior}      |
       LimmiteSuperior{limiteSuperior}")
    #Paso 3
    puntoMedio = limiteInferior + (limiteSuperior -
       limiteInferior)/2
    FP = evaluar(puntoMedio)

    #Paso 4
    if(FP == 0 or (limiteSuperior - limiteInferior)/2 <
       tolerancia):
        print(f"p = {FP}")
        break

    #Paso 5
    i = i + 1
    #Paso 6
    if(FA*FP > 0):
        limiteInferior = puntoMedio
        FA = FP
    else:
        limiteSuperior = puntoMedio
#Paso 7
print(f"El metodo fracaso despues de {numeroIteraciones}
   intentos. :c")
```

Conjunto de ejercicios

1. Use el método de la bisección para encontrar soluciones dentro de 10^{-2} para $x^3 - 7x^2 + 14x - 6 = 0$ en cada intervalo.

   a [0,1]

a	b	p	f(a)	f(b)	f(p)	TOL
0.0	1.0	0.5	-6.0	2.0	-0.625	0.5
0.5	1.0	0.75	-0.625	2.0	0.984375	0.25
0.5	0.75	0.625	-0.625	0.984375	0.259766	0.125
0.5	0.625	0.5625	-0.625	0.259766	-0.161865	0.0625
0.5625	0.625	0.59375	-0.161865	0.259766	0.054047	0.0312
0.5625	0.59375	0.578125	-0.161865	0.054047	-0.052624	0.0156
0.578125	0.59375	0.585938	-0.052624	0.054047	0.001035	0.0078

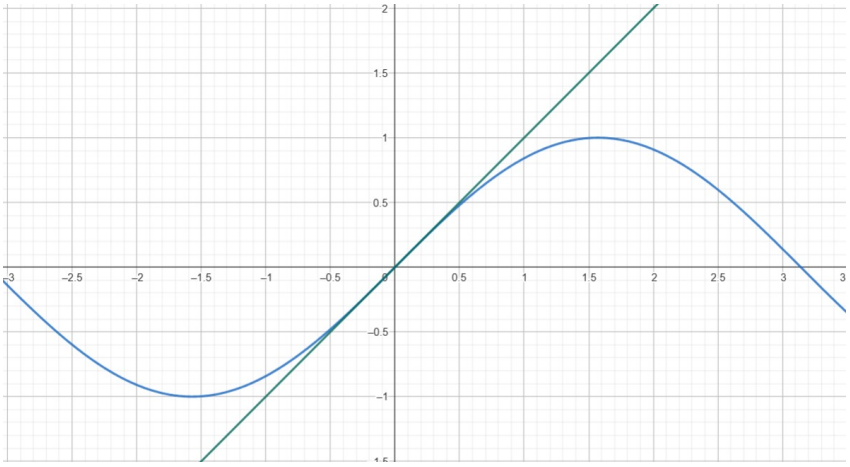
   b [1,3.2]

a	b	p	f(a)	f(b)	f(p)	TOL
1.0	3.2	2.1	2.0	-0.112	1.791	1.1
2.1	3.2	2.65	1.791	-0.112	0.552125	0.55
2.65	3.2	2.925	0.552125	-0.112	0.085828	0.275
2.925	3.2	3.0625	0.085828	-0.112	-0.054443	0.1375
2.925	3.0625	2.99375	0.085828	-0.054443	0.006328	0.0688
2.99375	3.0625	3.028125	0.006328	-0.054443	-0.026521	0.0344
2.99375	3.028125	3.010937	0.006328	-0.026521	-0.010696	0.0172
2.99375	3.010937	3.002344	0.006328	-0.010696	-0.002333	0.0086

c [3.2,4]

a	b	p	f(a)	f(b)	f(p)	TOL
3.2	4.0	3.6	-0.112	2.0	0.336	0.4
3.2	3.6	3.4	-0.112	0.336	-0.016	0.2
3.4	3.6	3.5	-0.016	0.336	0.125	0.1
3.4	3.5	3.45	-0.016	0.125	0.046125	0.05
3.4	3.45	3.425	-0.016	0.046125	0.013016	0.025
3.4	3.425	3.4125	-0.016	0.013016	-0.001998	0.0125
3.4125	3.425	3.41875	-0.001998	0.013016	0.005382	0.0062

2. a Dibuje las gráficas para $y = x$ y $y = \sin x$.

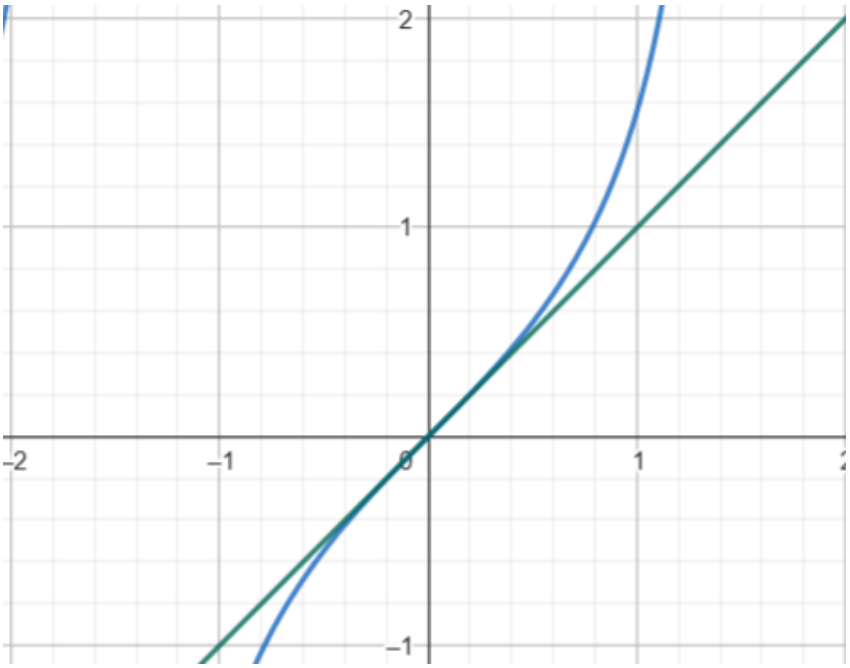


b Use el método de bisección para encontrar soluciones precisas dentro de 10^{-5} para el primer valor positivo de x con $x = 2\sin x$

$$x = 2\sin x$$
$$x - 2\sin x = 0$$

a	b	p	f(a)	f(b)	f(p)	TOL
-0.5	1.0	0.25	0.458851	-0.682942	-0.244808	0.75
-0.5	0.25	-0.125	0.458851	-0.244808	0.124349	0.375
-0.125	0.25	0.0625	0.124349	-0.244808	-0.062419	0.1875
-0.125	0.0625	-0.03125	0.124349	-0.062419	0.03124	0.09375
-0.03125	0.0625	0.015625	0.03124	-0.062419	-0.015624	0.046875
-0.03125	0.015625	-0.007812	0.03124	-0.015624	0.007812	0.023438
-0.007812	0.015625	0.003906	0.007812	-0.015624	-0.003906	0.011718
-0.007812	0.003906	-0.001953	0.007812	-0.003906	0.001953	0.005859
-0.001953	0.003906	0.000977	0.001953	-0.003906	-0.000977	0.00293
-0.001953	0.000977	-0.000488	0.001953	-0.000977	0.000488	0.001465
-0.000488	0.000977	0.000244	0.000488	-0.000977	-0.000244	0.000732
-0.000488	0.000244	-0.000122	0.000488	-0.000244	0.000122	0.000366
-0.000122	0.000244	0.000061	0.000122	-0.000244	-0.000061	0.000183
-0.000122	0.000061	-0.00003	0.000122	-0.000061	0.00003	0.000092
-0.00003	0.000061	0.000016	0.00003	-0.000061	-0.000016	0.000046
-0.00003	0.000016	-0.000007	0.00003	-0.000016	0.000007	0.000023
-0.000007	0.000016	0.000005	0.000007	-0.000016	-0.000005	0.000012
-0.000007	0.000005	-0.000001	0.000007	-0.000005	0.000001	0.000006

3. a Dibuje las gráficas para $y = x$ y $y = \tan x$.

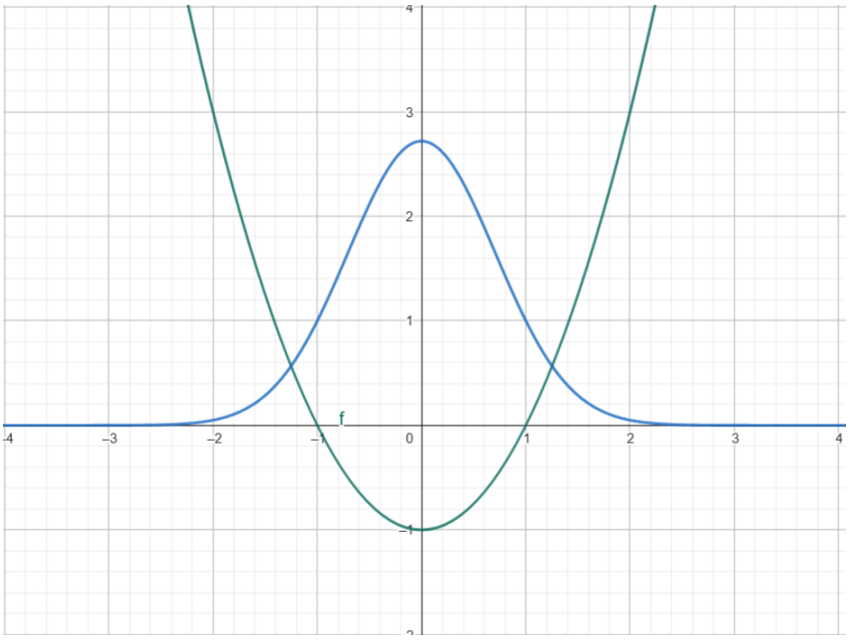


b Use el método de bisección para encontrar soluciones precisas dentro de 10^{-5} para el primer valor positivo de x con $x = \tan x$

$$x = \tan x$$
$$x - \tan x = 0$$

a	b	p	f(a)	f(b)	f(p)	TOL
-0.5	1.0	0.25	0.592605	-2.114815	-0.260684	0.75
-0.5	0.25	-0.125	0.592605	-0.260684	0.12631	0.375
-0.125	0.25	0.0625	0.12631	-0.260684	-0.062663	0.1875
-0.125	0.0625	-0.03125	0.12631	-0.062663	0.03127	0.09375
-0.03125	0.0625	0.015625	0.03127	-0.062663	-0.015628	0.046875
-0.03125	0.015625	-0.007812	0.03127	-0.015628	0.007812	0.023438
-0.007812	0.015625	0.003906	0.007812	-0.015628	-0.003906	0.011718
-0.007812	0.003906	-0.001953	0.007812	-0.003906	0.001953	0.005859
-0.001953	0.003906	0.000977	0.001953	-0.003906	-0.000977	0.00293
-0.001953	0.000977	-0.000488	0.001953	-0.000977	0.000488	0.001465
-0.000488	0.000977	0.000244	0.000488	-0.000977	-0.000244	0.000732
-0.000488	0.000244	-0.000122	0.000488	-0.000244	0.000122	0.000366
-0.000122	0.000244	0.000061	0.000122	-0.000244	-0.000061	0.000183
-0.000122	0.000061	-0.00003	0.000122	-0.000061	0.00003	0.000092
-0.00003	0.000061	0.000016	0.00003	-0.000061	-0.000016	0.000046
-0.00003	0.000016	-0.000007	0.00003	-0.000016	0.000007	0.000023
-0.000007	0.000016	0.000005	0.000007	-0.000016	-0.000005	0.000012
-0.000007	0.000005	-0.000001	0.000007	-0.000005	0.000001	0.000006

4. a Dibuje las gráficas para $y = x^2 - 1$ y $y = e^{1-x^2}$.



b Use el método de bisección para encontrar una aproximación dentro de 10^{-3} para un vaor en [0 , 2] con $x^2 - 1 = e^{1-x^2}$.

$$x^2 - 1 = e^{1-x^2}$$

$$x^2 - 1 - e^{1-x^2} = 0$$

a	b	p	f(a)	f(b)	f(p)	TOL
-2.0	0.0	-1.0	2.950213	-3.718282	-1.0	1.0
-2.0	-1.0	-1.5	2.950213	-1.0	0.963495	0.5
-1.5	-1.0	-1.25	0.963495	-1.0	-0.007283	0.25
-1.5	-1.25	-1.375	0.963495	-0.007283	0.480226	0.125
-1.375	-1.25	-1.3125	0.480226	-0.007283	0.237195	0.0625
-1.3125	-1.25	-1.28125	0.237195	-0.007283	0.115153	0.03125
-1.28125	-1.25	-1.265625	0.115153	-0.007283	0.053986	0.015625
-1.265625	-1.25	-1.257812	0.053986	-0.007283	0.023362	0.007812
-1.257812	-1.25	-1.253906	0.023362	-0.007283	0.008043	0.003906
-1.253906	-1.25	-1.251953	0.008043	-0.007283	0.000381	0.001953
-1.251953	-1.25	-1.250977	0.000381	-0.007283	-0.003449	0.000977
-1.251953	-1.250977	-1.251465	0.000381	-0.003449	-0.001534	0.000488
-1.251953	-1.251465	-1.251709	0.000381	-0.001534	-0.000577	0.000244
-1.251953	-1.251709	-1.251831	0.000381	-0.000577	-0.000098	0.000122
-1.251953	-1.251831	-1.251892	0.000381	-0.000098	0.000141	0.000061
-1.251892	-1.251831	-1.251861	0.000141	-0.000098	0.00002	0.000031
-1.251861	-1.251831	-1.251846	0.00002	-0.000098	-0.000039	0.000015
-1.251861	-1.251846	-1.251853	0.00002	-0.000039	-0.000012	0.000007

5. Sea $f(x) = (x+2)(x+1)^2x(x-1)^3(x-2)$. ¿En qué cero de f converge el método de bisección cuando se aplica en los siguientes intervalos?

   a [-1.5,2.5]

a	b	p	f(a)	f(b)	f(p)	TOL
-1.5	2.5	0.5	-10.253906	232.558594	0.527344	2.0
-1.5	0.5	-0.5	-10.253906	0.527344	-1.582031	1.0
-0.5	0.5	0.0	-1.582031	0.527344	0.0	0.5

   El método de bisección converge en 0

   b [-0.5,2.4]

a	b	p	f(a)	f(b)	f(p)	TOL
-0.5	2.4	0.95	-1.582031	133.987983	0.001399	1.45
-0.5	0.95	0.225	-1.582031	0.001399	0.620709	0.725
-0.5	0.225	-0.1375	-1.582031	0.620709	-0.599346	0.3625
-0.1375	0.225	0.04375	-0.599346	0.620709	0.166624	0.18125
-0.1375	0.04375	-0.046875	-0.599346	0.166624	-0.19532	0.090625
-0.046875	0.04375	-0.001563	-0.19532	0.166624	-0.006262	0.045312
-0.001563	0.04375	0.021094	-0.006262	0.166624	0.082514	0.022656
-0.001563	0.021094	0.009765	-0.006262	0.082514	0.03867	0.011329
-0.001563	0.009765	0.004101	-0.006262	0.03867	0.016336	0.005664
-0.001563	0.004101	0.001269	-0.006262	0.016336	0.00507	0.002832
-0.001563	0.001269	-0.000147	-0.006262	0.00507	-0.000588	0.001416
-0.000147	0.001269	0.000561	-0.000588	0.00507	0.002243	0.000708
-0.000147	0.000561	0.000207	-0.000588	0.002243	0.000828	0.000354
-0.000147	0.000207	0.00003	-0.000588	0.000828	0.00012	0.000177
-0.000147	0.00003	-0.000058	-0.000588	0.00012	-0.000232	0.000088
-0.000058	0.00003	-0.000014	-0.000232	0.00012	-0.000056	0.000044
-0.000014	0.00003	0.000008	-0.000056	0.00012	0.000032	0.000022
-0.000014	0.000008	-0.000003	-0.000056	0.000032	-0.000012	0.000011
-0.000003	0.000008	0.000002	-0.000012	0.000032	0.000008	0.000005

El método de bisección converge en 0.000002

c [-0.5,3]

a	b	p	f(a)	f(b)	f(p)	TOL
-0.5	3.0	1.25	-1.582031	1920.0	-0.241013	1.75
1.25	3.0	2.125	-0.241013	1920.0	15.235282	0.875
1.25	2.125	1.6875	-0.241013	15.235282	-4.56395	0.4375
1.6875	2.125	1.90625	-4.56395	15.235282	-4.388551	0.21875
1.90625	2.125	2.015625	-4.388551	15.235282	1.204863	0.109375
1.90625	2.015625	1.960938	-4.388551	1.204863	-2.360267	0.054688
1.960938	2.015625	1.988282	-2.360267	1.204863	-0.800946	0.027343
1.988282	2.015625	2.001953	-0.800946	1.204863	0.141833	0.013671
1.988282	2.001953	1.995118	-0.800946	0.141833	-0.343991	0.006835
1.995118	2.001953	1.998536	-0.343991	0.141833	-0.104728	0.003417
1.998536	2.001953	2.000244	-0.104728	0.141833	0.017587	0.001708
1.998536	2.000244	1.99939	-0.104728	0.017587	-0.043802	0.000854
1.99939	2.000244	1.999817	-0.043802	0.017587	-0.013165	0.000427
1.999817	2.000244	2.00003	-0.013165	0.017587	0.00216	0.000213
1.999817	2.00003	1.999923	-0.013165	0.00216	-0.005542	0.000107
1.999923	2.00003	1.999977	-0.005542	0.00216	-0.001656	0.000054
1.999977	2.00003	2.000004	-0.001656	0.00216	0.000288	0.000027
1.999977	2.000004	1.999991	-0.001656	0.000288	-0.000648	0.000014
1.999991	2.000004	1.999998	-0.000648	0.000288	-0.000144	0.000007

El método de bisección converge en 1.999998

d [-3,-0.5]

a	**b**	**p**	**f(a)**	**f(b)**	**f(p)**	**TOL**
-3.0	-0.5	-1.75	3840.0	-1.582031	-19.192429	1.25
-3.0	-1.75	-2.375	3840.0	-19.192429	283.204185	0.625
-2.375	-1.75	-2.0625	283.204185	-19.192429	16.980619	0.3125
-2.0625	-1.75	-1.90625	16.980619	-19.192429	-14.07363	0.15625
-2.0625	-1.90625	-1.984375	16.980619	-14.07363	-3.181891	0.078125
-2.0625	-1.984375	-2.023438	16.980619	-3.181891	5.52375	0.039062
-2.023438	-1.984375	-2.003907	5.52375	-3.181891	0.85635	0.019532
-2.003907	-1.984375	-1.994141	0.85635	-3.181891	-1.237985	0.009766
-2.003907	-1.994141	-1.999024	0.85635	-1.237985	-0.210046	0.004883
-2.003907	-1.999024	-2.001466	0.85635	-0.210046	0.318401	0.002441
-2.001466	-1.999024	-2.000245	0.318401	-0.210046	0.052969	0.001221
-2.000245	-1.999024	-1.999634	0.052969	-0.210046	-0.078948	0.000611
-2.000245	-1.999634	-1.999939	0.052969	-0.078948	-0.013173	0.000306
-2.000245	-1.999939	-2.000092	0.052969	-0.013173	0.019879	0.000153
-2.000092	-1.999939	-2.000015	0.019879	-0.013173	0.00324	0.000077
-2.000015	-1.999939	-1.999977	0.00324	-0.013173	-0.004968	0.000038
-2.000015	-1.999977	-1.999996	0.00324	-0.004968	-0.000864	0.000019
-2.000015	-1.999996	-2.000005	0.00324	-0.000864	0.00108	0.000009

El método de bisección converge en -2.000005