Ejercicio 1. Encuentre la raíz positiva más pequeña de las siguientes funciones mediante el método de bisección con una tolerancia 0.001 y considerando la longitud del intervalo en el caso indicado.

Longitud del intervalo = 0.75

$$a)\ f(x) = \tan x - x + 2$$

Código

```
clc; clear all; close all;
f=inline('tanh(x)-x+2');
x=-10:0.75:10;
y=f(x);
plot(x,y)
hold on
grid on
plot(x,zeros(size(x)),'m*-')
a=2.98;
b=3;
```

Command Window

```
>> x1=(a+b)/2
x1 =
    3
>> f(a)
ans =
   0.4866
>> f(b)
ans =
  -0.5018
>> f(x1)
ans =
  -0.0049
>> (b-a)/2
ans =
   0.5000
>> b=x1;
>> x2=(a+b)/2
x2 =
   2.7500
>> f(x2)
ans =
   0.2419
>> (b-a)/2
ans =
```

```
>> a=x2;
>> x3=(a+b)/2
x3 =
   2.8750
>> f(x3)
ans =
   0.1187
>> (b-a)/2
ans =
   0.1250
>> a=x3;
>> x4=(a+b)/2
x4 =
   2.9375
>> f(x4)
ans =
   0.0569
>> (b-a)/2

ans =
   0.0625
```

```
>> a=x4;
>> x5=(a+b)/2
x5 =
   2.9688
>> f(x5)
ans =
   0.0260
>> (b-a)/2
ans =
   0.0313
>> a=x5;
>> x6=(a+b)/2
x6 =
   2.9844
>> f(x6)
ans =
   0.0105
>> (b-a)/2
ans =
   0.0156
```

```
>> a=x6;
>>
x7=(a+b)/2
x7 =
   2.9922
>> f(x7)
ans =
   0.0028
>> (b-a)/2
ans =
   0.0078
>> a=x7;
>>
x8=(a+b)/2
x8 =
   2.9961
>> f(x8)
ans =
  -0.0011
>> (b-a)/2
ans =
   0.0039
```

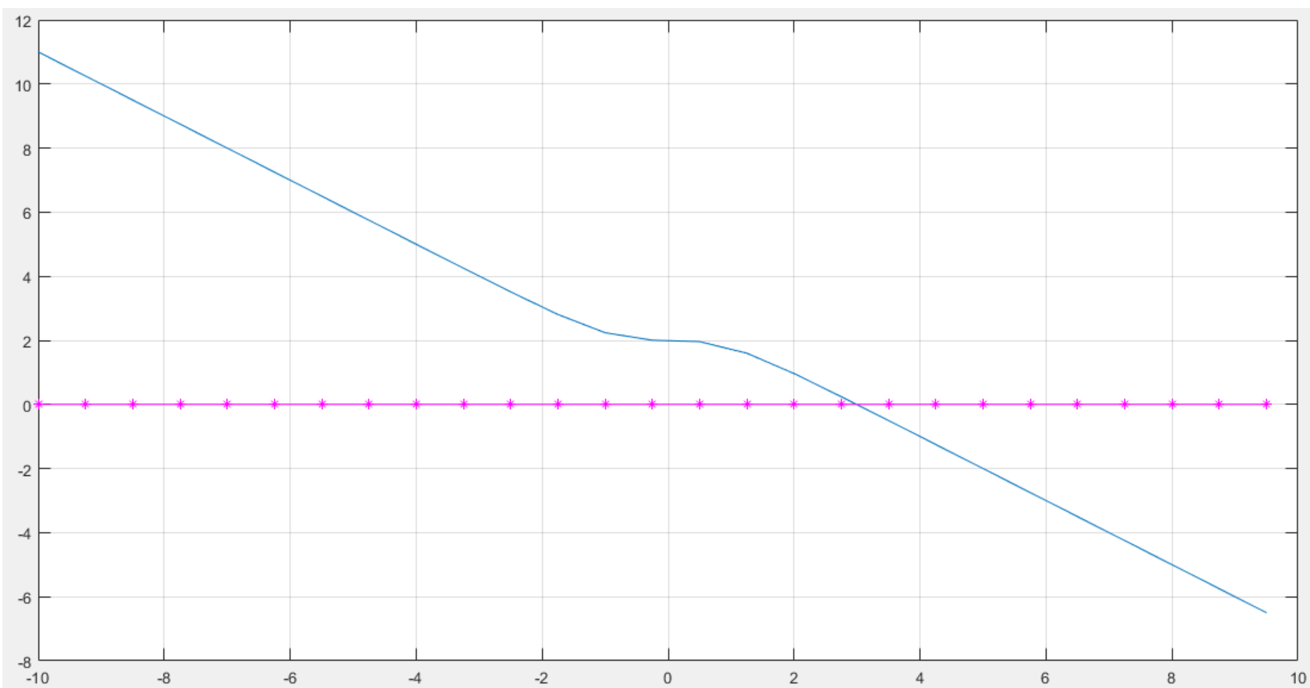
```
>> b=x8;
>> x9=(a+b)/2

x9 =
   2.9941
>> f(x9)
ans =
  8.5598e-04
>> (b-a)/2
ans =
   0.0020
>> a=x9;
>>
x10=(a+b)/2
x10 =
   2.9951
>> f(x10)
ans =
  -1.1084e-04
>> (b-a)/2
ans =
  9.7656e-04
```

Tabla

a	xi	b	f(a)	f(xi)	f(b)	error	
2.5	3	3.5	+	-	-	0.5	0.001
2.5	2.75	3	+	+	-	0.25	
2.75	2.875	3	+	+	-	0.125	
2.875	2.9375	3	+	+	-	0.0625	
2.9375	2.9688	3	+	+	-	0.0313	
2.9688	2.9844	3	+	+	-	0.0156	
2.9844	2.9922	3	+	+	-	0.0078	
2.9922	2.9961	3	+	-	-	0.0039	
2.9922	2.9941	2.9961	+	+	-	0.002	
2.9941	2.9951	2.9961	+	-	-	9.77E-04	

Gráfica



Raíz= 2.9951

b) $\ln x - 0.8x^2 + 2 = 0$

Código

```
clc, clear all, close all;
f=inline('12*x.^5-10*x.^3+2*x.^2+3*x-0.3');
x=-.9:0.75:.9;
y=f(x);
plot(x,y)
grid on
hold on
plot(x,zeros(size(x)),'cd--')
a=-0.15;
b=0.6;
```

Command Window

```
>> x1=(a+b)/2
x1 = 0.2250
>> f(a)
ans =
  -0.6722
>> f(b)
ans =
   0.9931
>> f(x1)
Ans=
   0.3693
>> (b-a)/2
ans =
   0.3750
>> b=x1
b =
   0.2250
>> b=x1;
>> x2=(a+b)/2
x2 =
   0.0375
>> f(x2)
ans =
  -0.1852
>> (b-a)/2
```

```
>> a=x2;
>> x3=(a+b)/2
x3 =
   0.1312
>> f(x3)
ans =
   0.1061
>> (b-a)/2
ans =
   0.0938
>> b=x3;
>> x4=(a+b)/2
x4 =
   0.0844
>> f(x4)
ans =
  -0.0386
>> (b-a)/2
ans =
   0.0469
```

```
>> a=x4;
>> x5=(a+b)/2
x5 =
   0.1078
>> f(x5)
ans =
   0.0343
>> (b-a)/2
ans =
   0.0234
>> b=(x5);
>> x6=(a+b)/2
x6 =
   0.0961
>> f(x6)
ans =
  -0.0020
>> (b-a)/2
ans =
   0.0117
```

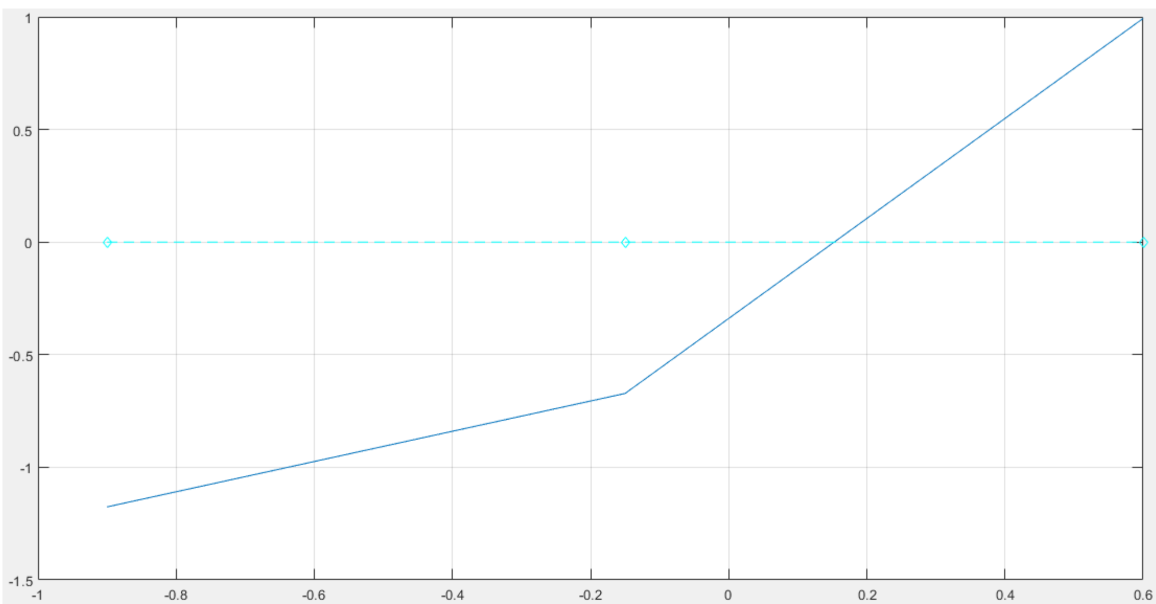
```
>> a=(x6);
>> x7=(a+b)/2
x7 =
   0.1020
>> f(x7)
ans =
   0.0162
>> (b-a)/2
ans =
   0.0059
>> b=(x7);
>> x8=(a+b)/2
x8 =
   0.0990
>> f(x8)
ans =
   0.0071
>> (b-a)/2
ans =
   0.0029
```

```
>> b=(x8);
>> x9=(a+b)/2
x9 =
   0.0976
>> f(x9)
ans =
   0.0025
>> (b-a)/2
ans =
   0.0015
>> b=(x9);
>> x10=(a+b)/2
x10 =
   0.0968
>> f(x10)
ans =
  2.5351e-04
>> (b-a)/2
ans =
  7.3242e-04
```

Tabla

a	xi	b	f(a)	f(xi)	f(b)	error	
-0.15	0.225	0.6	-	+	+	0.375	0.001
-0.15	0.0375	0.225	-	-	+	0.1875	
0.0375	0.1312	0.225	-	+	+	0.0938	
0.0375	0.0844	0.1312	-	-	+	0.0469	
0.0844	0.1078	0.1312	-	+	+	0.0234	
0.0844	0.0961	0.1078	-	-	+	0.0117	
0.0961	0.102	0.1078	-	+	+	0.0059	
0.0961	0.099	0.102	-	+	+	0.0029	
0.0961	0.0976	0.099	-	+	+	0.0015	
0.0961	0.0968	0.0976	-	+	+	7.32E-04	

Gráfica



Raíz= 0.0968

Ejercicio 3. Una masa de 1 kg de CO está contenida en un recipiente a T = 222Ky P = 68 bar/mol. La ecuación de estado de Van Der Waals para un gas no ideal está dada por:

$$\left(P+\frac{a}{v^2}\right)(v-b)=\bar{R}T$$

Datos:

$$R = 0.08314\ \frac{bar\cdot m^3}{kg\cdot mol\cdot K}$$
$$a = 1.572\ \frac{bar\cdot m^6}{kg^2\cdot mol}$$
$$b = 0.0411\ \frac{m^3}{kg}$$

Determine el volumen especifico $v\ (m^3/kg)$ por medio del método de la bisección empleando una longitud del intervalo = 1 y una tolerancia de 0.01. Incluir la gráfica.

$$\left(68+\frac{1.572}{v^2}\right)(v-0.0411)=(0.08314)(222)$$
$$\left(68+\frac{1.572}{v^2}\right)(v-0.0411)-(0.08314)(222)=0$$

i	xi	error
0	3	-
1	0.2982	2.7018
2	0.2335	0.0647
3	0.23	0.0035

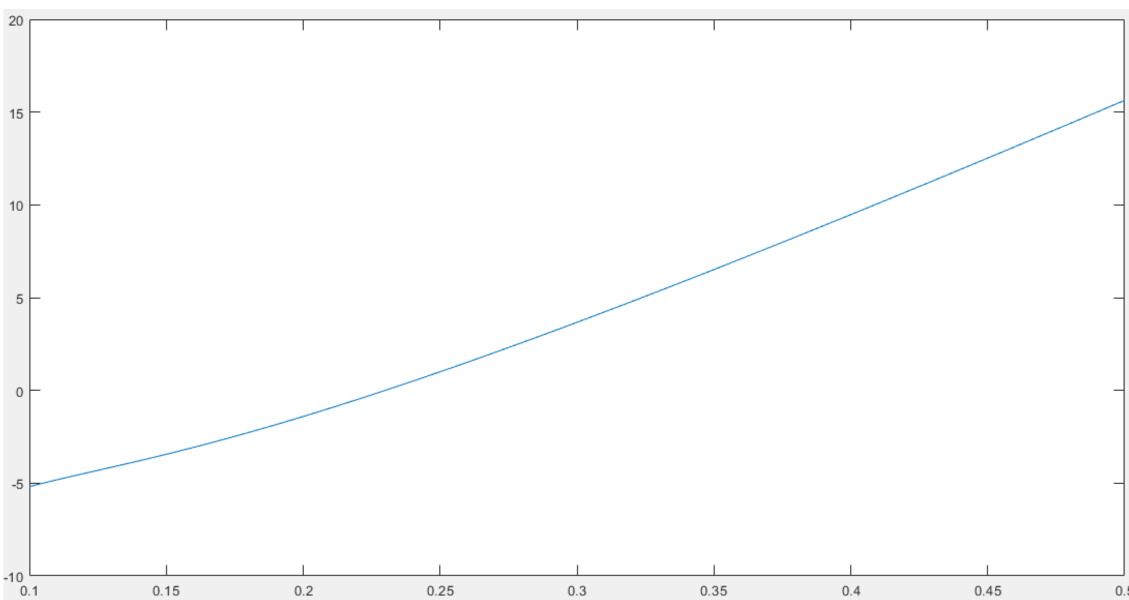
Código

```
clc; clear all; close all
f=inline('(68+(1.572)./(v.^2)).*(v-0.0411)-
0.08314*222')
v=0.1:0.001:0.5;
plot(v,f(v))
hold on
syms v
f1=diff(f(v));
f1=inline(f1);
x0=3
```

Command Window

```
f =Inline function:
f(v) = (68+(1.572)./(v.^2)).*(v-0.0411)-0.08314*222
x0 =
3
x1=x0-f(x0)/f1(x0)
x1 =
        0.2982
e=abs(x1-x0)
e =
        2.7018
x2=x1-f(x1)/f1(x1)
x2 =
        0.2335
e=abs(x2-x1)
e =
        0.0647
x3=x2-f(x2)/f1(x2)
x3 =
        0.2300
e=abs(x3-x2)
e =
        0.0035
x4=x3-f(x3)/f1(x3)
x4 =
        0.2300
e=abs(x4-x3)
e =
  1.4915e-05
```

Gráfica



Volumen $= 0.23 m^3/kg$