SIGNALS AND SYSTEMS (IT204)

ASSIGNMENT 7

Name: Sachin Prasanna

Roll no : 211IT058

1) Write a MATLAB/ Python program to find one sided z-transform of the following standard causal signals.

a) n b) a^n c) na^n d) e^{-anT}

ANSWERS

CODE

```
clear all
syms n T a real;
syms z complex;


%1)a
x1 = n;
disp('Z transform of n is: ');
y1 = ztrans(x1);
disp(y1);
fplot(y1 , [-100 100]);


%1)b
x2 = a^n;
disp('Z transform of a^n is: ');
y2 = ztrans(x2);
disp(y2);

%Taking the value of a = 2 for plotting purpose
x21 = 2^n;
y21 = ztrans(x21);
fplot(y21, [-100,100]);
```

```
26
27      %1)c
28      x3 = n*(a^n);
29      disp('Z transform of n*(a^n) is: ');
30      y3 = ztrans(x3);
31      disp(y3);
32
33      %Taking the value of a = 2 for plotting purpose
34      x31 = n*(2^n);
35      y31 = ztrans(x31);
36      fplot(y31, [-100,100]);
37
38
39      %1)d
40      x4 = exp(-a*n*T);
41      disp('Z transform of exp(-a*n*T) is: ');
42      y4 = ztrans(x4);
43      disp(y4);
44
45      %Taking the value of a = 2, T = 2 for plotting purpose
46      x41 = exp(-2*n*2);
47      y41 = ztrans(x41);
48      fplot(y41, [-100,100]);
49
```

OUTPUT

```
>> Question1
Z transform of n is:
z/(z - 1)^2

Z transform of a^n is:
-z/(a - z)

Z transform of n*(a^n) is:
(a*z)/(a - z)^2

Z transform of exp(-a*n*T) is:
z/(z - exp(-T*a))

>>
```

GRAPHS (one for each subpart, in order)

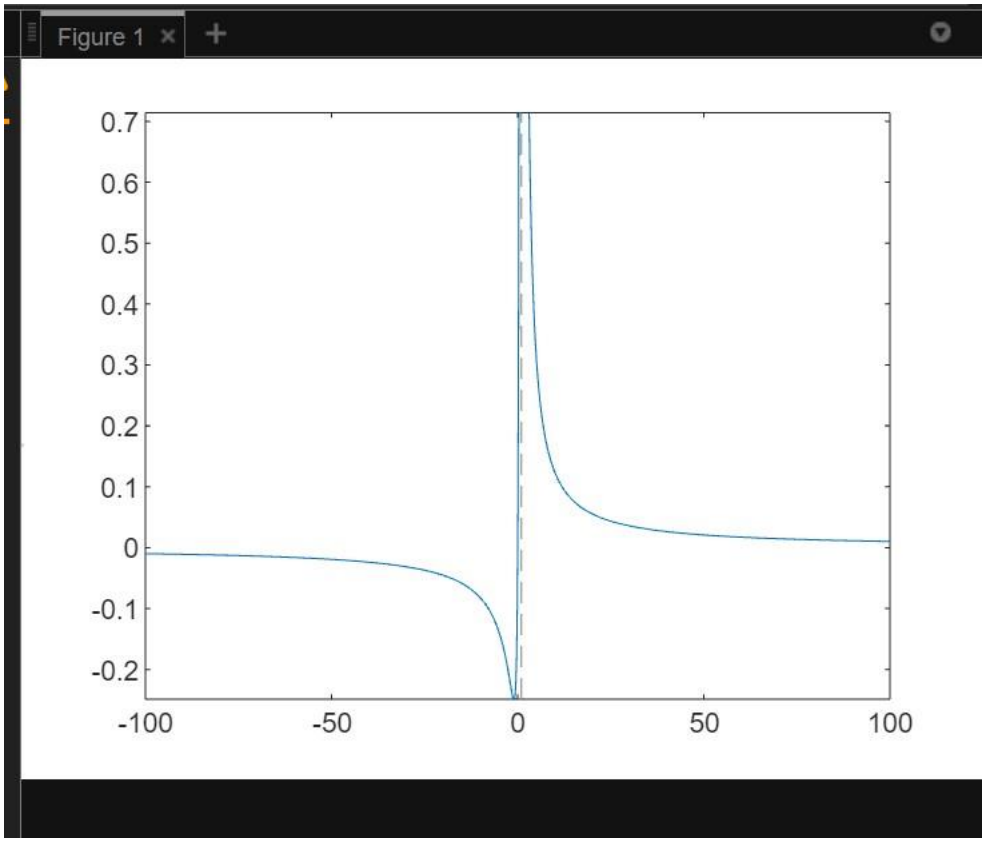
Figure 1
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-100
-50
0
50
100

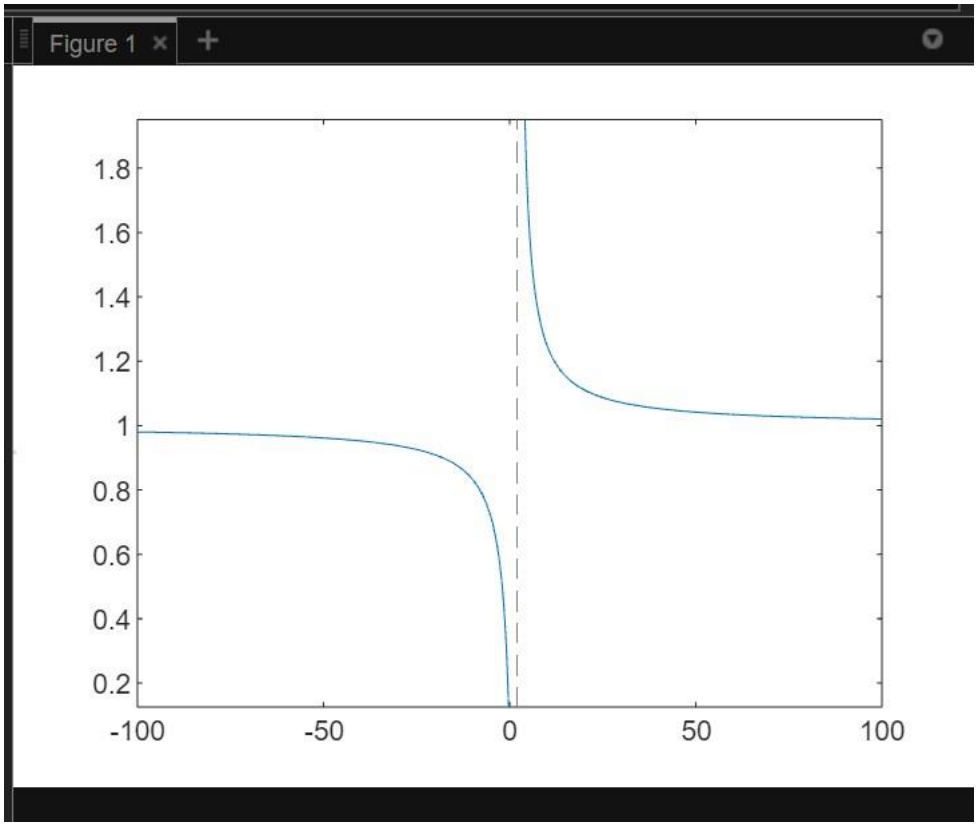
Figure 1
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
-100
-50
0
50
100

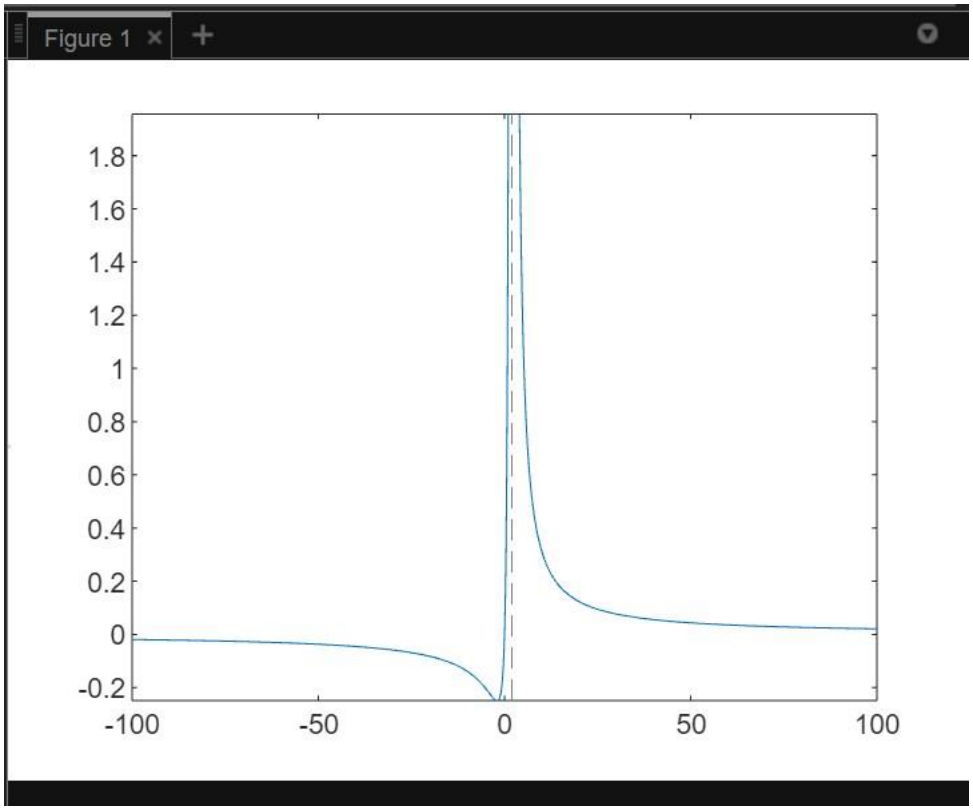
Figure 1
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-100
-50
0
50
100

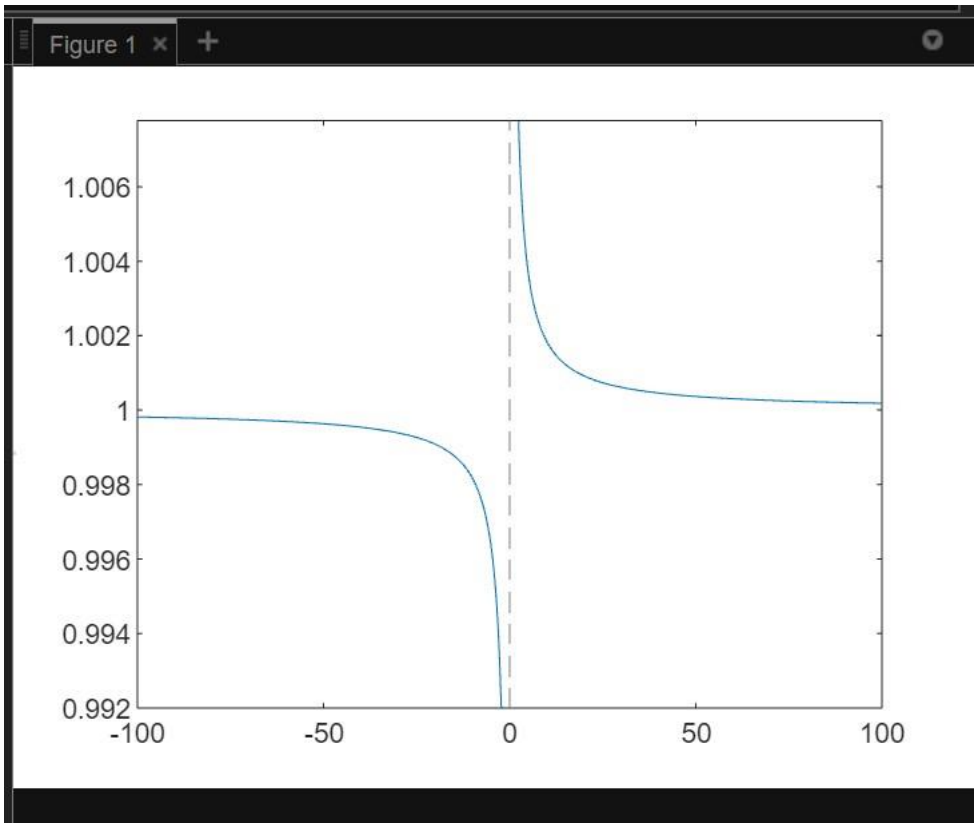
Figure 1
1.006
1.004
1.002
1
0.998
0.996
0.994
0.992
-100
-50
0
50
100

2) Write a MATLAB/ Python program to find z-transform of the following standard causal signals.

a) 0.5^n b) $1+n(0.4)^{(n-1)}$

ANSWERS

CODE

```
clear all
syms n z real;


%2)a
x = 0.5^n;
disp('z transform of 0.5^n is: ');
x1 = ztrans(x);
disp(x1);
fplot(x1, [-5 5]);


%2)b
y = 1+n*(0.4^(n-1));
disp('z transform of 1+n*(0.4^(n-1)): ');
y1 = ztrans(y);
disp(y1);
fplot(y1, [-5 5]);


```

OUTPUT

```
>> Question2
z transform of 0.5^n is:
z/(z - 1/2)

z transform of 1+n*(0.4^(n-1)):
z/(z - 1) + (25*z)/(5*z - 2)^2
```

GRAPHS (one for each subpart, in order)

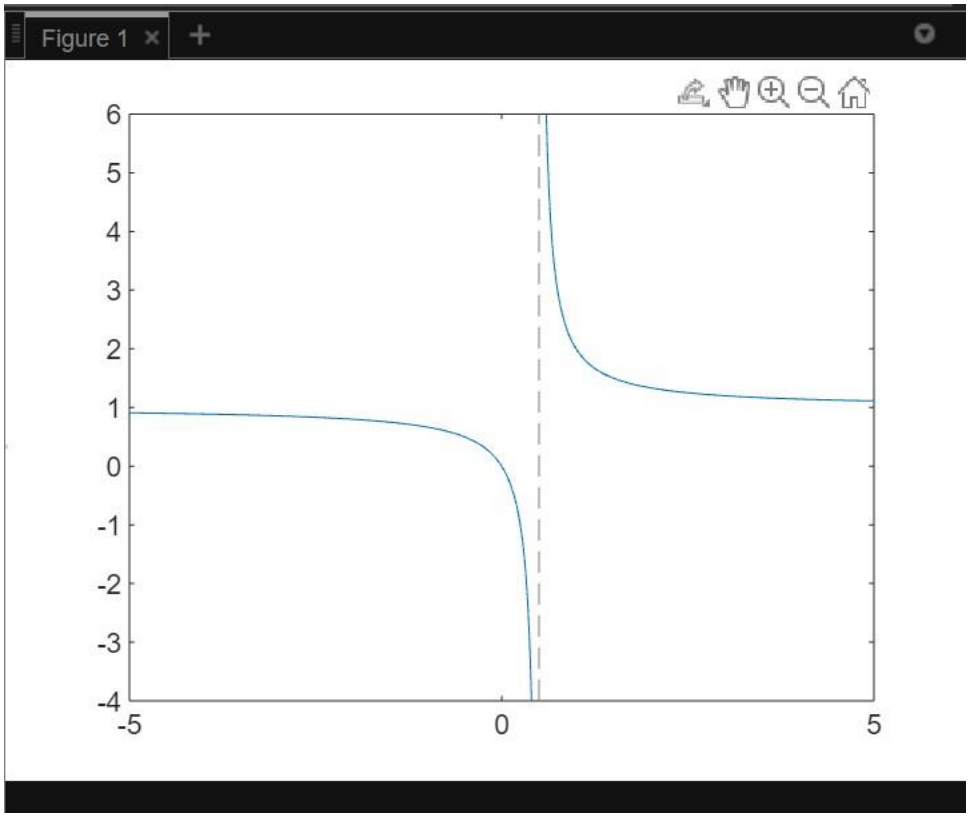
Figure 1
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
0
5

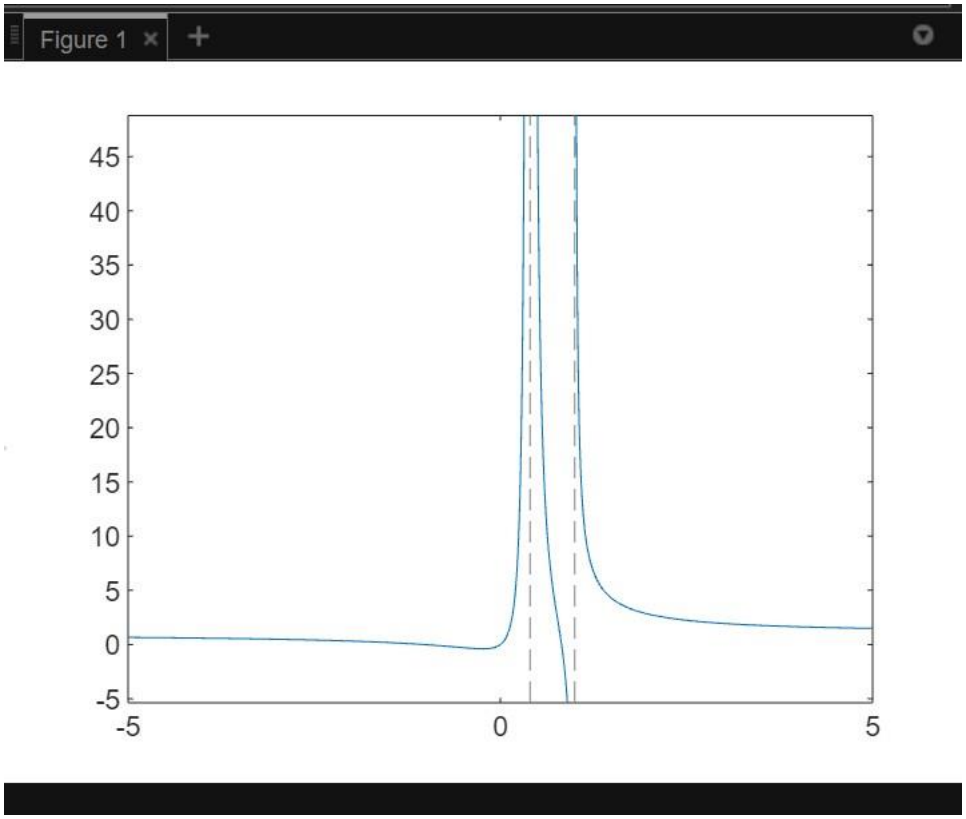
Figure 1
45
40
35
30
25
20
15
10
5
0
-5
-5
0
5

3) Write a MATLAB/ Python program to find inverse z-transform of the following z-domain signals.

a) $1/ (1 - 1.5z^{-1} + 0.5^{-2})$

b) $1/((1 + z^{-1}) + (1 – z^{-1})^2)$

ANSWERS

CODE

```
syms n z

%3)a
x = 1/(1-1.5*(z^(-1)) + 0.5*(z^(-2)));
disp('Inverse Z transform of 1/(1-1.5*(z^(-1)) + 0.5*(z^(-2))) is: ');
X = iztrans(x,z,n);
simplify(X);
disp(X);
%fplot(X, [-5 5]);

%3)b

y = 1/((1+(z^(-1)))*((1-(z^(-1))^2)));
disp('Inverse Z transform of 1/((1+(z^(-1)))*((1-(z^(-1))^2))) is: ');
Y = iztrans(y,z,n);
simplify(Y);
disp(Y);
fplot(x1, [-5 5]);

```

OUTPUT

```
>> Question3
Inverse Z transform of 1/(1-1.5*(z^(-1)) + 0.5*(z^(-2))) is:
2 - (1/2)^n

Inverse Z transform of 1/((1+(z^(-1)))*((1-(z^(-1))^2))) is:
(5*(-1)^n)/4 + ((-1)^n*(n - 1))/2 + 1/4

>>
```

GRAPHS (one for each subpart, in order)

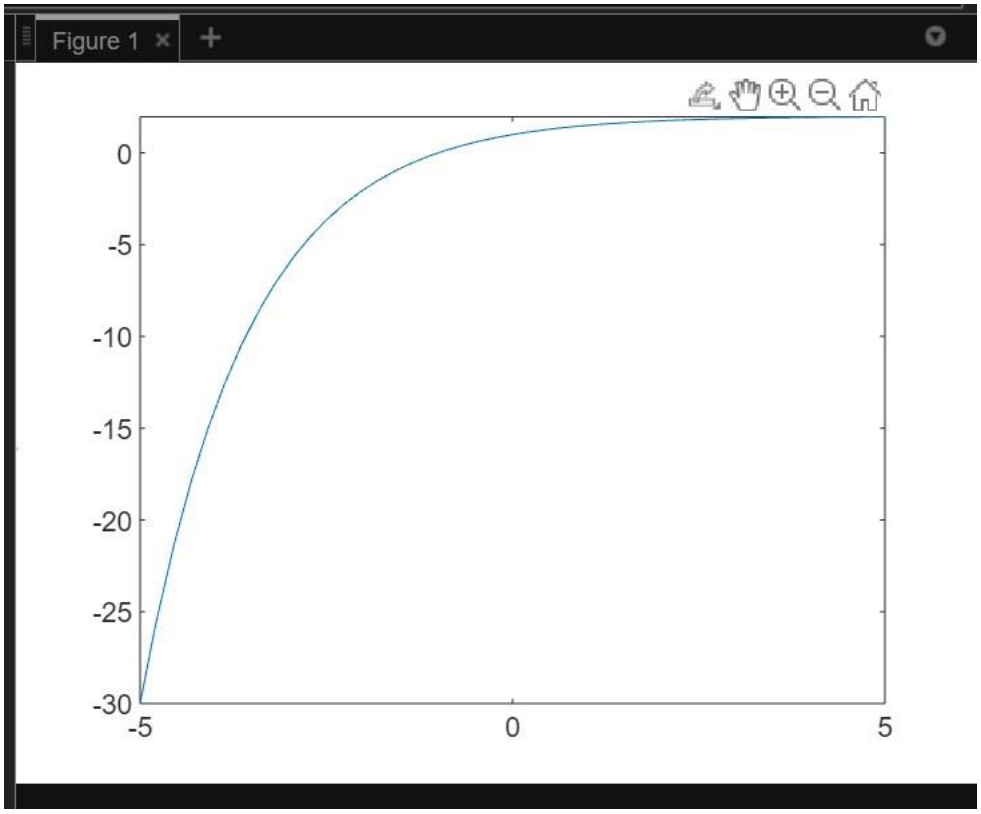
Figure 1
0
-5
-10
-15
-20
-25
-30
-5
0
5

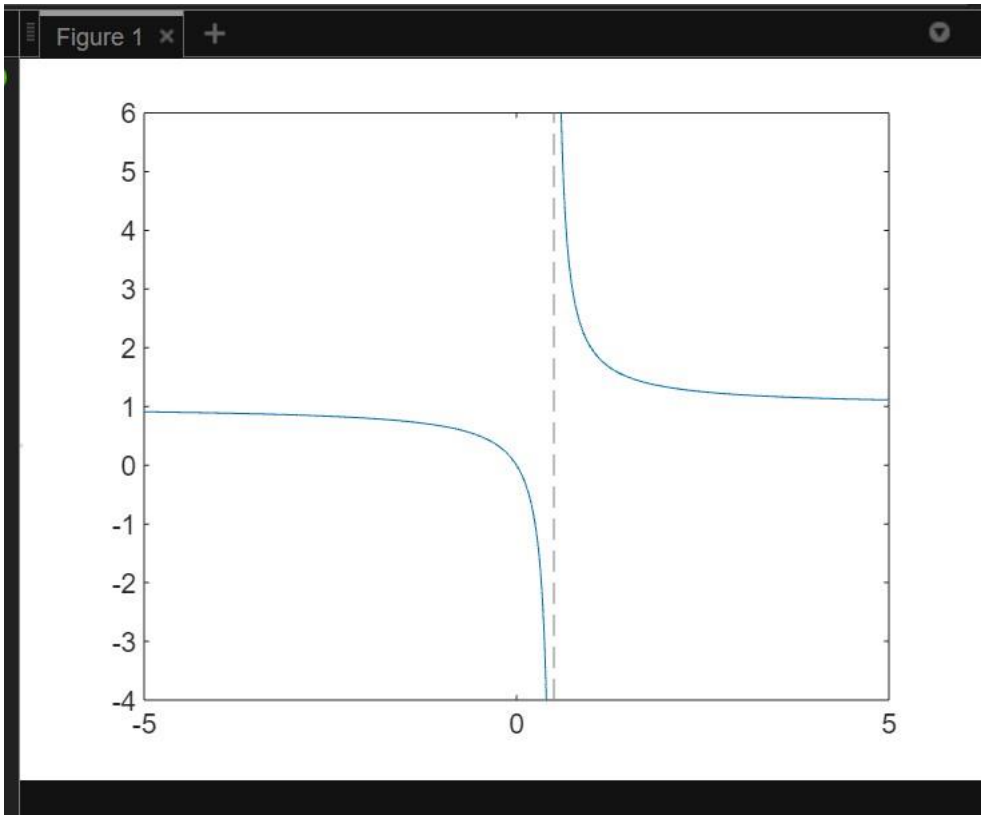
Figure 1
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
0
5