```
clear all ;
close all ;
clc ;
```

Norm 2 of SISO systems

```
num = [1,-1] ;
den = [1,2,10] ;
G = tf(num,den) ;
```

Frequency response of G

```
g = @(omega) abs(squeeze(freqresp(G,omega))).^2 ;

omega_min_max = 10000 ;
omega_stamp = 0.7 ;
omega_values = -omega_min_max:omega_stamp:omega_min_max ;

FreqNormSISO = sqrt( sum(g(omega_values) * omega_stamp ) / (2*pi) ) ;

disp( FreqNormSISO )
```

```
    0.5244
```

```
```

Impulse response

```
T = linspace(0,5,5000) ;
[ Y , T ] = impulse(G, T) ;
ImpulseNormSISO = (trapz(T,abs(Y).^2))^0.5 ;

disp(ImpulseNormSISO) ;
```

```
    0.5244
```

```
```

State space method

```
[A,B,C,D] = ssdata(G) ;
```

```
LSISO = are(A', zeros(2,2), B*B') ;
SSNormSISO = sqrt( trace(C*LSISO*C') ) ;

disp(SSNormSISO) ;
```

```
    0.5244
```

```

```

True norm

```
TrueNormSISO = norm(G, 2) ;
disp( TrueNormSISO ) ;
```

```
    0.5244
```

Norm 2 MIMO systems

```

A2 = [ 20 -27 7 ; 53 -63 13 ; -5 12 -8 ] ;
B2 = [ 1 -1 ; -2 -1 ; -3 0 ] ;
C2 = [ 0 0 -2 ; 1 -1 -1 ] ;
D2 = [ 0 0 ; 0 0 ] ;

systf=tf(ss(A2,B2,C2,D2)) ;
```

Frequency response of G

```

G = @(omega) freqresp(systf,omega) ;

G_conj = @(omega) ctranspose(freqresp(systf,omega)) ;
tr = @(omega) trace(G_conj(omega)*G(omega)) ;

omega_min_max = 1000 ;
omega_stamp = 0.1    ;
omega_values = -omega_min_max:omega_stamp:omega_min_max ;

integrand_values = zeros(size(omega_values));

for i = 1:length(omega_values)
    integrand_values(i) = tr(omega_values(i)) ;
end

FreqNormMIMO = sqrt( sum( integrand_values * omega_step ) / (2*pi) ) ;

disp( FreqNormMIMO ) ;
```

State space method

```
LMIMO = are(A2', zeros(3,3), B2*B2') ;
SSNormMIMO = sqrt( trace(C2*LMIMO*C2') ) ;

disp( SSNormMIMO ) ;
```

```
    2.2818
```

```
```

True norm

```
TrueNormMIMO = norm(systf, 2) ;

disp( TrueNormMIMO ) ;
```

```
    2.2818
```

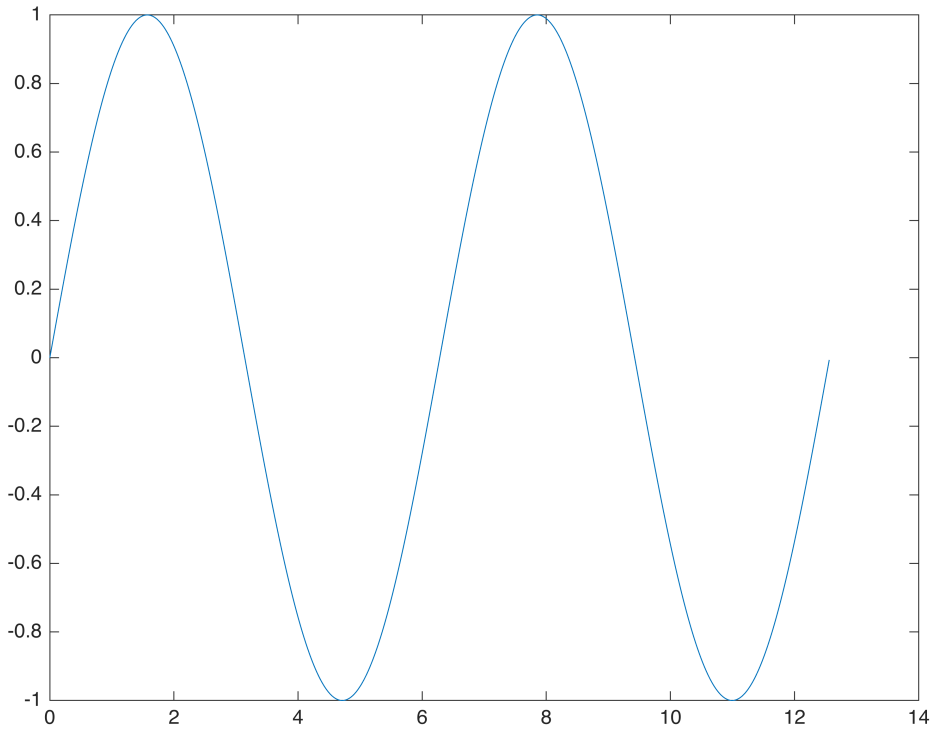
```
```

print random to check view

```
a = 0:0.01:(4*pi) ;
b = sin(a)
```

```
b = 1×1257
         0    0.0100    0.0200    0.0300    0.0400    0.0500    0.0600    0.0699 ···
```

```
figure
plot(a, b)
```


1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
2
4
6
8
10
12
14