```
Overdamped 2nd order system
z =
    1.5000
p =
  -10.4721
   -1.5279
==============================================
Critically damped 2nd order system
z =
     1
p =
    -4
    -4
==============================================
Underdamped 2nd order system
z =
    0.0250
p =
  -0.1000 + 3.9987i
  -0.1000 - 3.9987i
==============================================
Undamped 2nd order system
z =
     0
p =
   0.0000 + 4.0000i
   0.0000 - 4.0000i
==============================================
Negatively underdamped 2nd order system
z =
   -0.0150
p =
   0.0600 + 3.9995i
   0.0600 - 3.9995i
==============================================
Negatively critically damped 2nd order system
z =
    -1
p =
     4
     4
==============================================
Negatively overdamped 2nd order system
z =
   -1.1500
p =
    6.8716
    2.3284
```

stability_2nd_order_sys.m

C:\Mydata\1_USC\courses\EMCH516\EMCH516 Core\EMC.

```
%{
examples of 2nd order system stability
%}
%% initialization
clc
clear
format compact
%% initial data
wn=4;   % natural frequency wm, rad/sec
%% Overdamped 2nd order system
display('Overdamped 2nd order system')
z=150e-2   % damping z%
A=[1 2*z*wn wn^2];
p=roots(A)
display('=============================================)
%% Critically damped 2nd order system
display('Critically damped 2nd order system')
z=100e-2   % damping z%
A=[1 2*z*wn wn^2];
p=roots(A)
display('=============================================)
%% Underdamped 2nd order system
display('Underdamped 2nd order system')
z=2.5e-2   % damping z%
A=[1 2*z*wn wn^2];
p=roots(A)
display('=============================================)
%% Undamped 2nd order system
display('Undamped 2nd order system')
z=0        % damping z%
A=[1 2*z*wn wn^2];
p=roots(A)
display('=============================================)
%% Negatively underdamped 2nd order system
display('Negatively underdamped 2nd order system)
z=-1.5e-2   % damping z%
A=[1 2*z*wn wn^2];
```

```
p=roots(A)
display('==================================================')
%% Negatively critically damped 2nd order system
display('Negatively critically damped 2nd order system')
z=-100e-2   % damping z%
A=[1 2*z*wn wn^2];
p=roots(A)
display('==================================================')
%% Negatively overdamped 2nd order system
display('Negatively overdamped 2nd order system')
z=-115e-2   % damping z%
A=[1 2*z*wn wn^2];
p=roots(A)
display('==================================================')
```