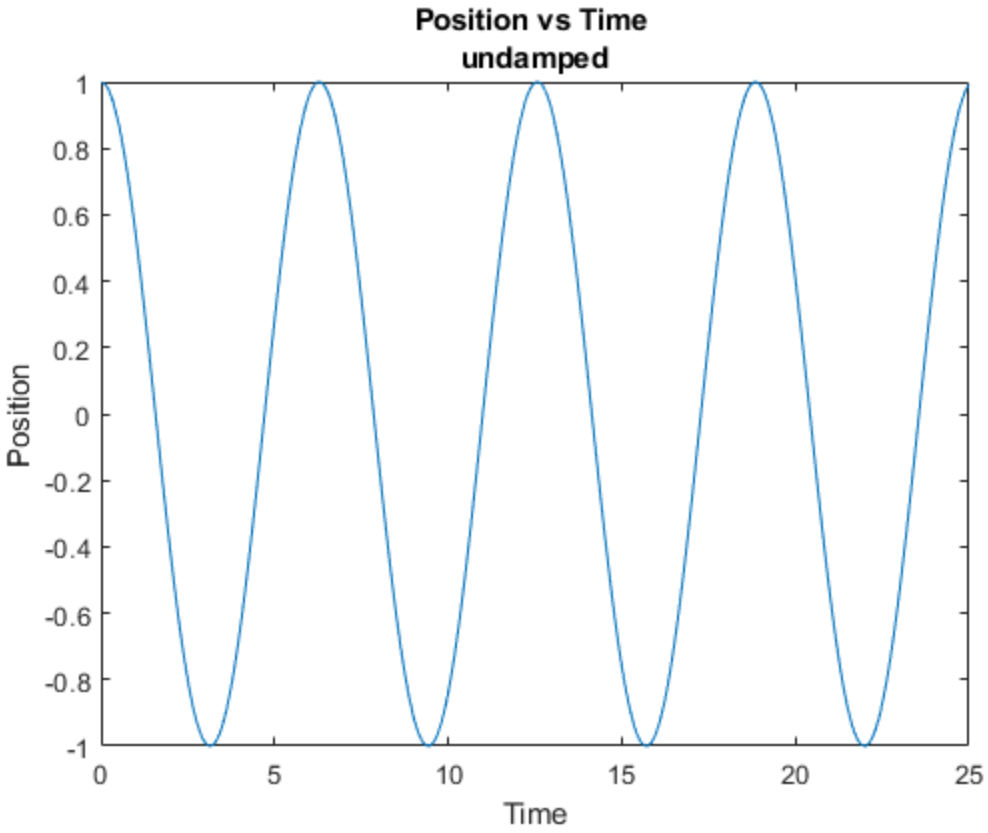
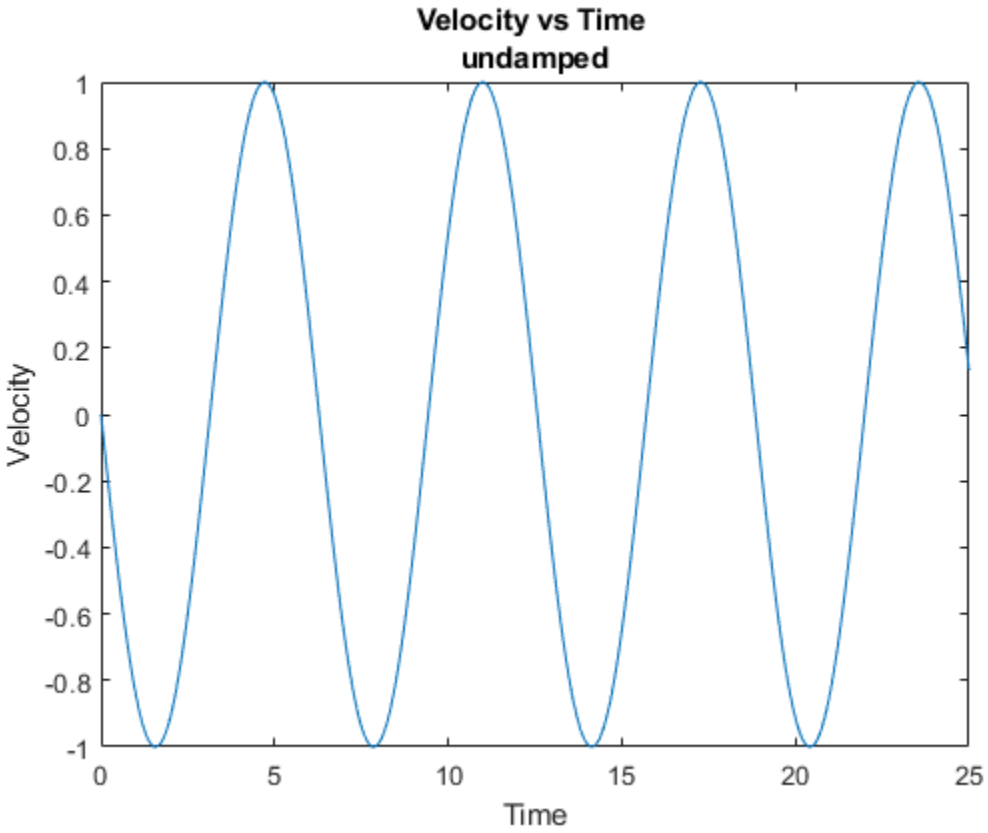
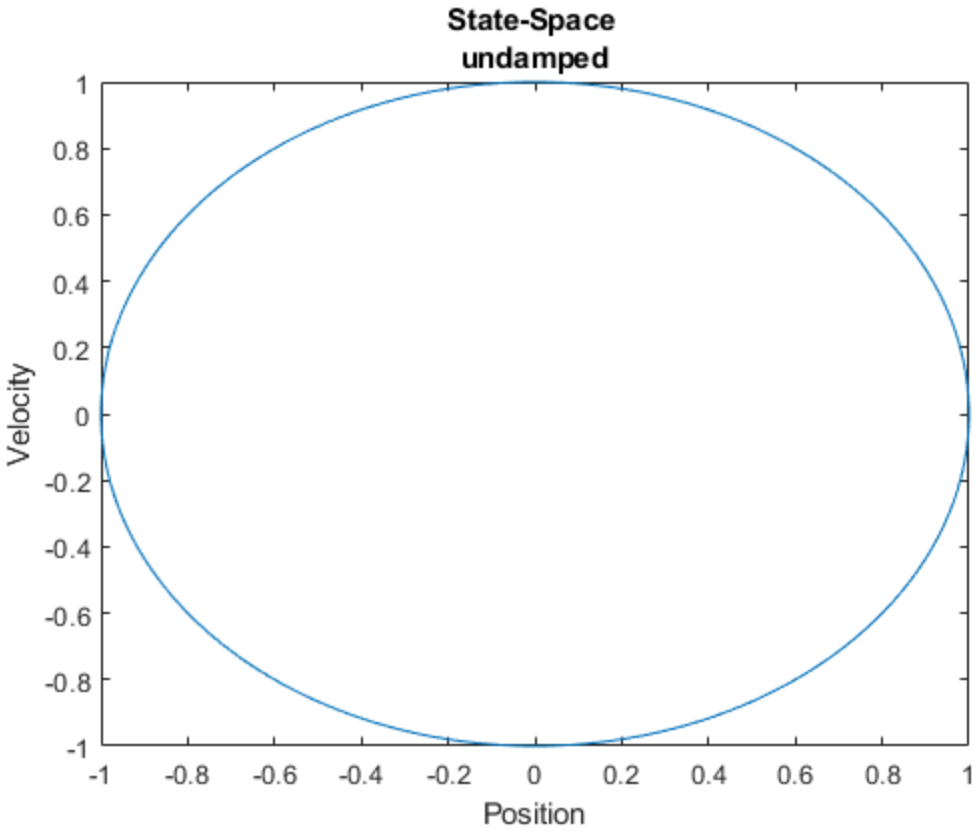
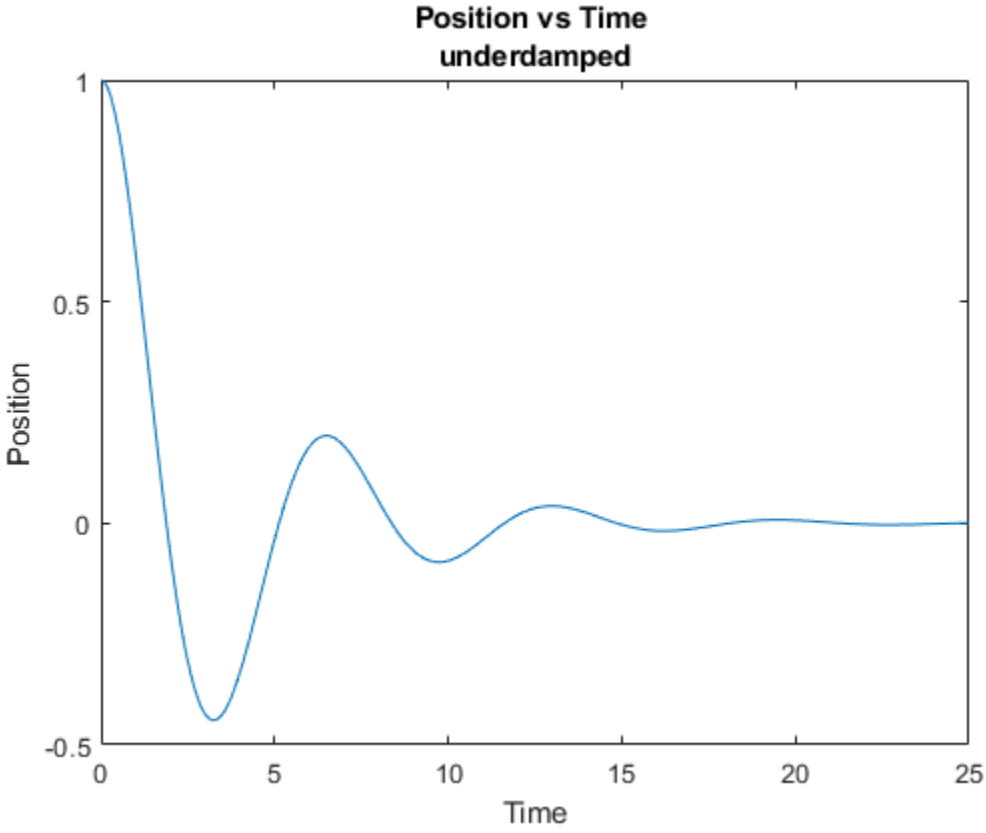
```
clear ; close all ;
tspan = [ 0 , 25 ] ;
x0 = [ 1 ; 0 ] ;
nf = 1 ;
dr = [ 0 , .25 , 1 , 2 ] ;
part = [ "undamped" , "underdamped" , "critically damped"
 , "overdamped" ] ;


for ii = 1:4
    options = odeset( 'AbsTol' , 1e-8 , 'RelTol' , 1e-8 ) ;
    [ t , x ] = ode45( @SpringDamper , tspan , x0 , options , nf ,
 dr(ii) ) ;
    figure
    plot( t , x(:,1) )
    title([ 'Position vs Time ' , part(ii) ])
    xlabel( 'Time' )
    ylabel( 'Position' )
    figure
    plot( t , x(:,2) )
    title([ 'Velocity vs Time ' , part(ii) ])
    xlabel( 'Time' )
    ylabel( 'Velocity' )
    figure
    plot( x(:,1) , x(:,2) )
    title([ 'State-Space ' , part(ii) ])
    xlabel( 'Position' )
    ylabel( 'Velocity' )
end

disp( '11' )
disp( 'The best scenario is is critically damped because it achieves
 steady ')
disp( 'state soonest but overdamped is better thannunderdamped' )
```

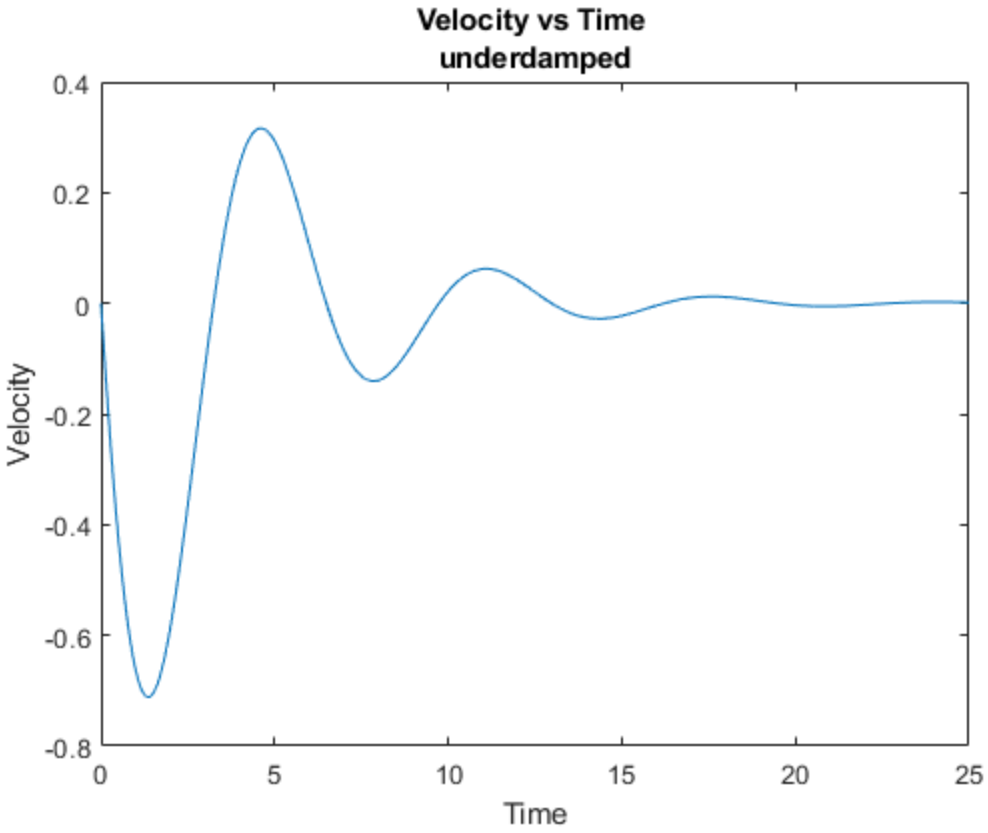
```
11
The best scenario is is critically damped because it achieves steady
state soonest but overdamped is better thannunderdamped
```

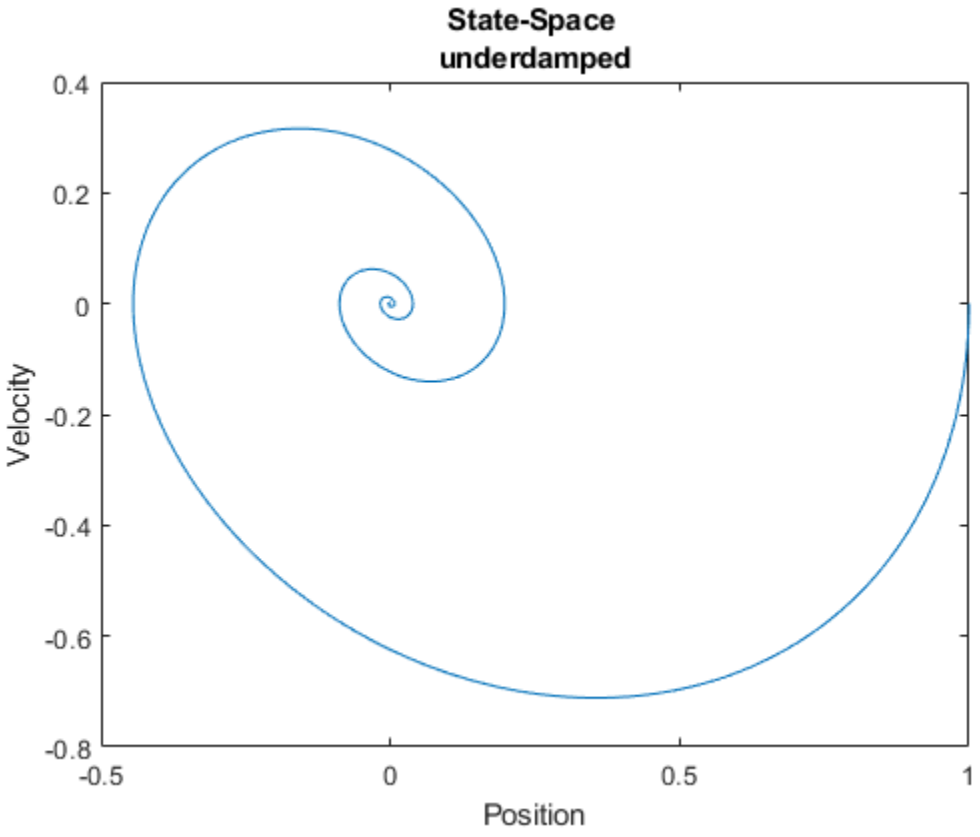

Position vs Time
undamped
Position
Time
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
5
10
15
20
25

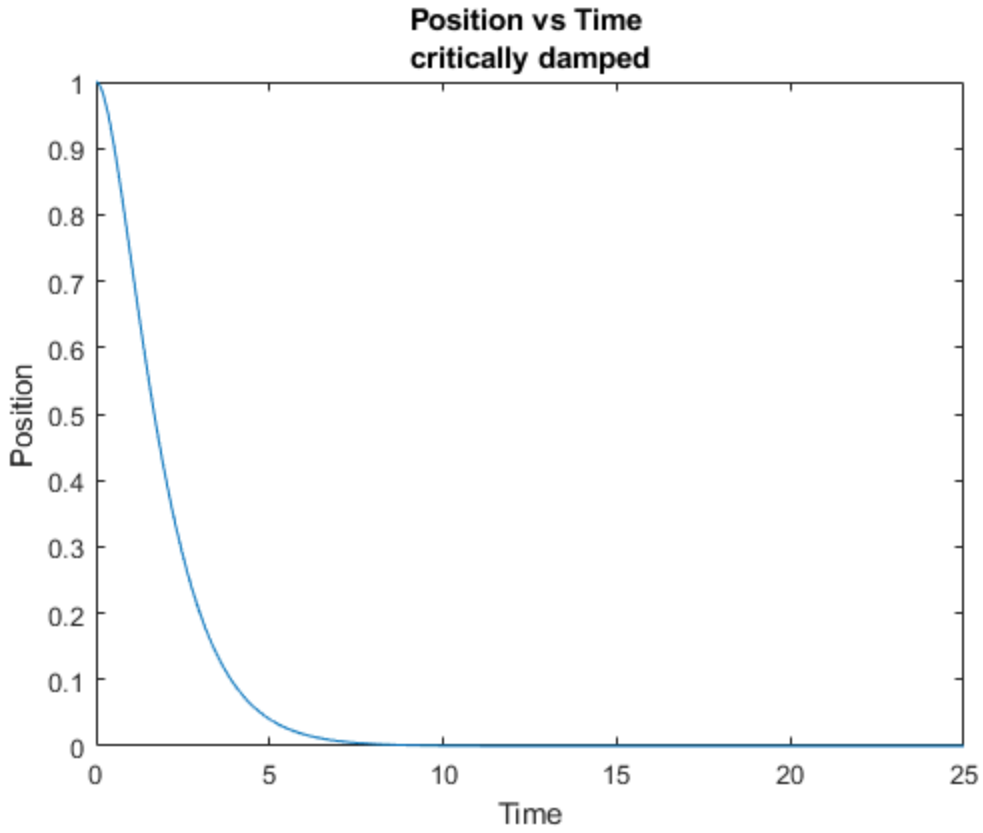

Velocity vs Time
undamped
Velocity
Time
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
5
10
15
20
25

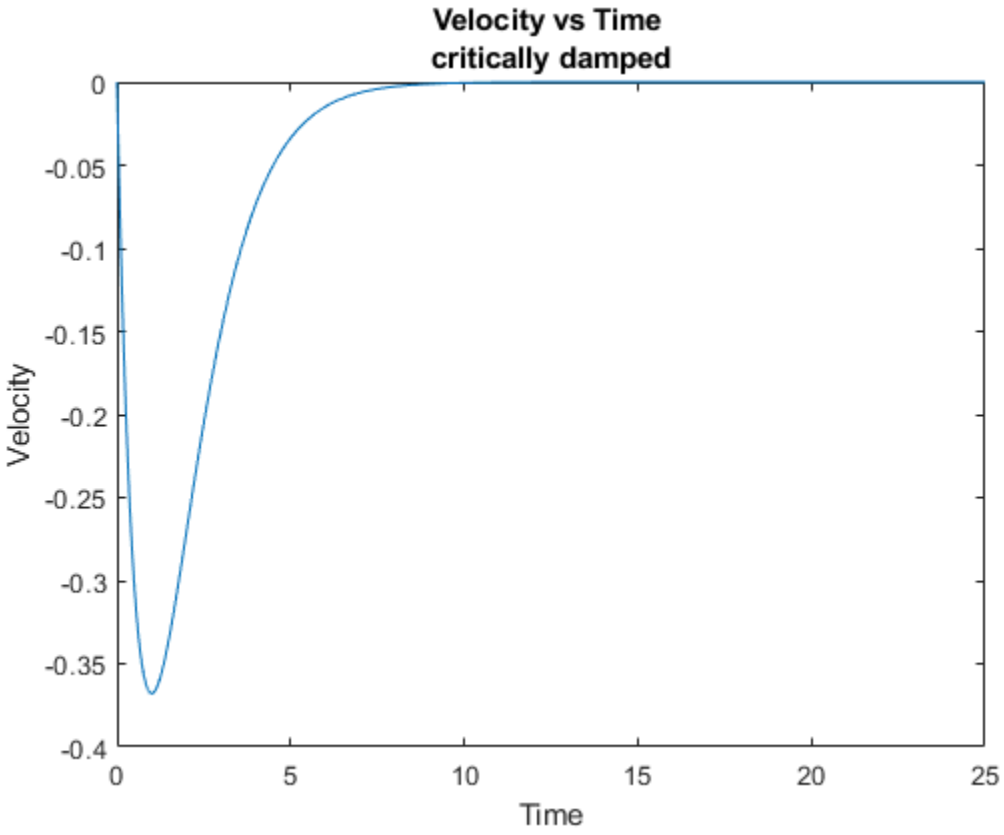

State-Space
undamped
Velocity
Position
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1

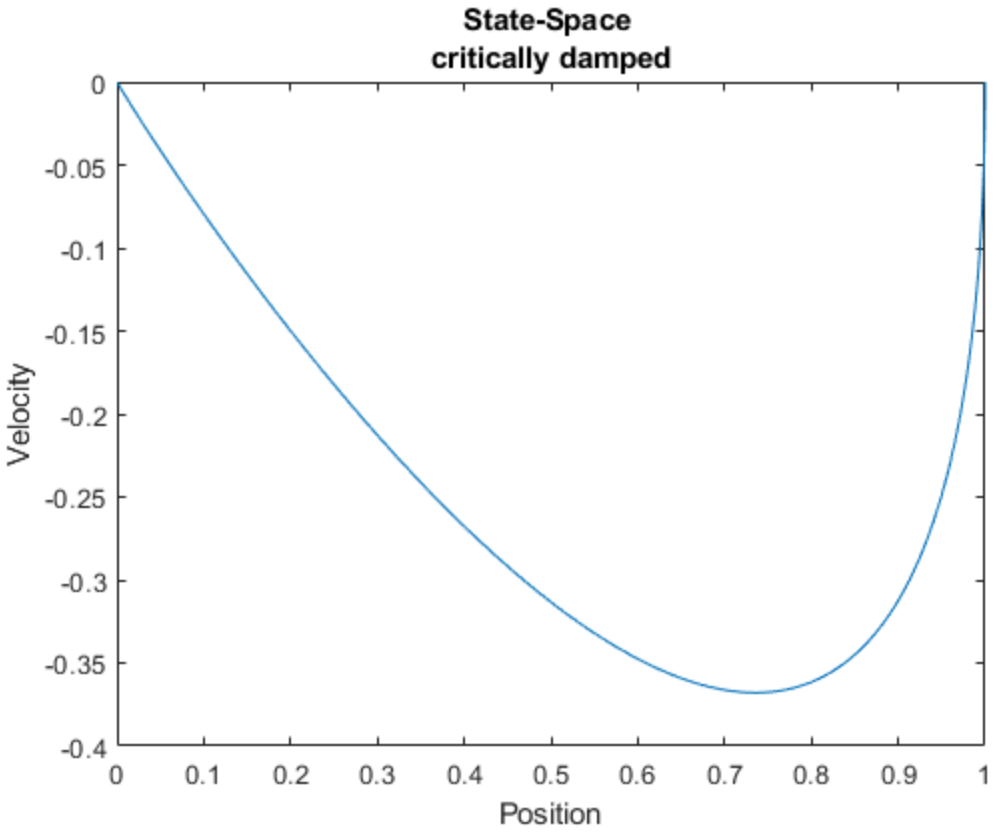

Position vs Time
underdamped
Position
Time
1
0.5
0
-0.5
0
5
10
15
20
25

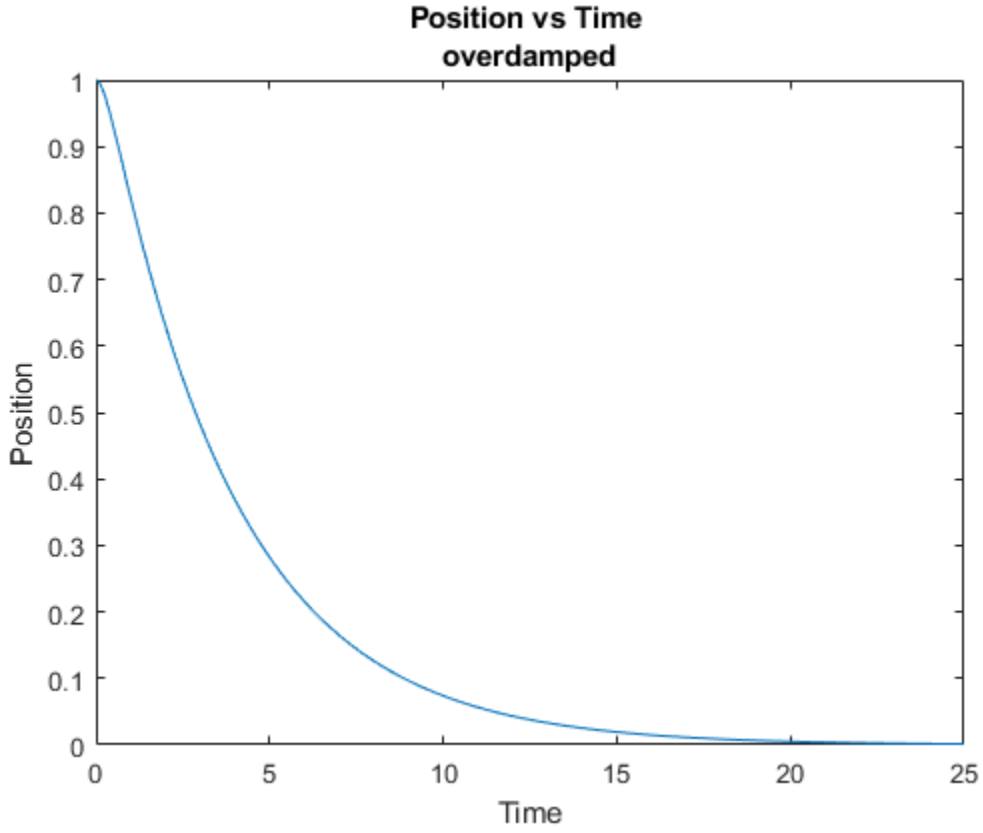

Velocity vs Time
underdamped
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
Velocity
0
5
10
15
20
25
Time

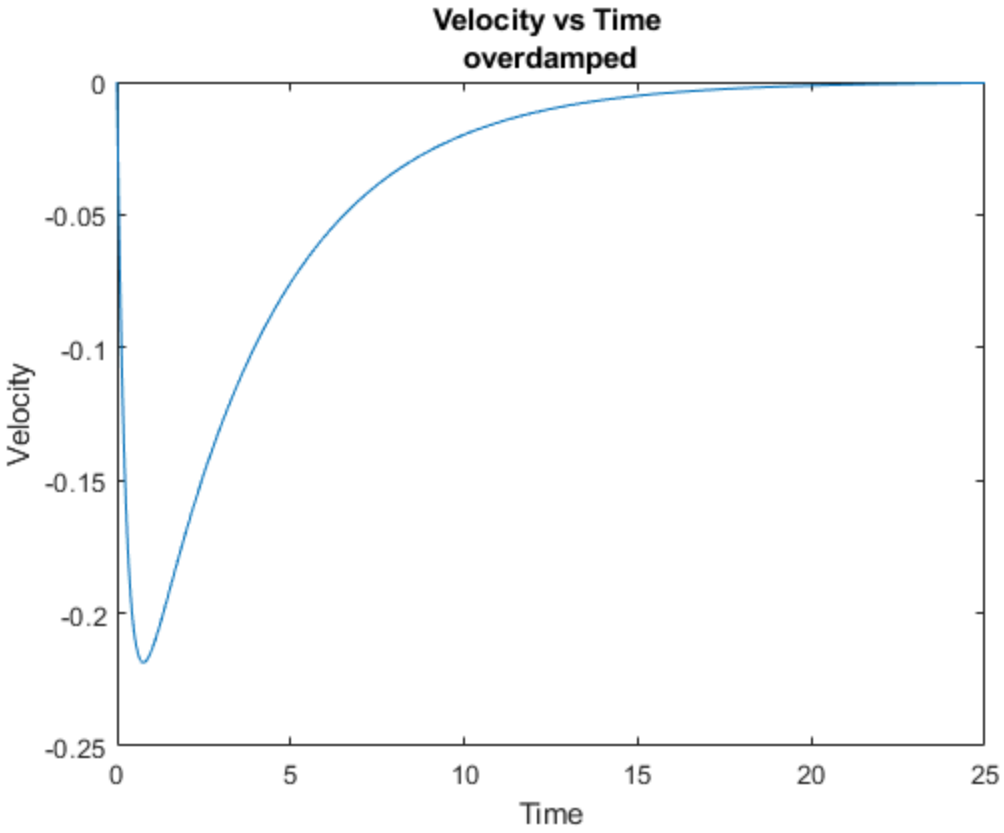

State-Space
underdamped
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
Velocity
-0.5
0
0.5
1
Position

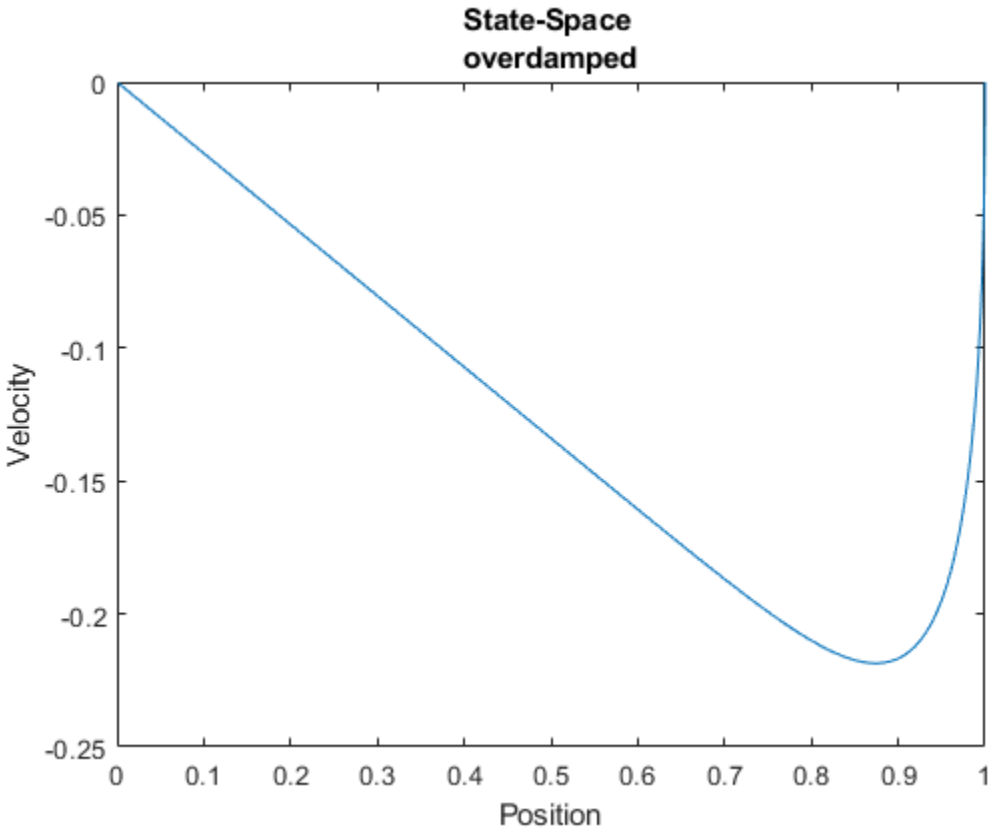

Position vs Time
critically damped
Position
Time
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
5
10
15
20
25


Velocity vs Time
critically damped
Velocity
Time
0
-0.05
-0.1
-0.15
-0.2
-0.25
-0.3
-0.35
-0.4
0
5
10
15
20
25


State-Space
critically damped
Velocity
Position
0
-0.05
-0.1
-0.15
-0.2
-0.25
-0.3
-0.35
-0.4
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1


Position vs Time
overdamped
Position
Time
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
5
10
15
20
25


Velocity vs Time
overdamped
0
-0.05
-0.1
-0.15
-0.2
-0.25
Velocity
0
5
10
15
20
25
Time


State-Space
overdamped
0
-0.05
-0.1
-0.15
-0.2
-0.25
Velocity
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Position

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