```
sys_open = tf([1],[1 2 1 0]);
sys_closed = feedback(sys_open,1,-1)
figure(1)
margin(sys_open)
[Gm,Pm,Wcg,Wcp] = margin(sys_open)
figure(2)
step(sys_closed)
S = stepinfo(sys_closed)
```

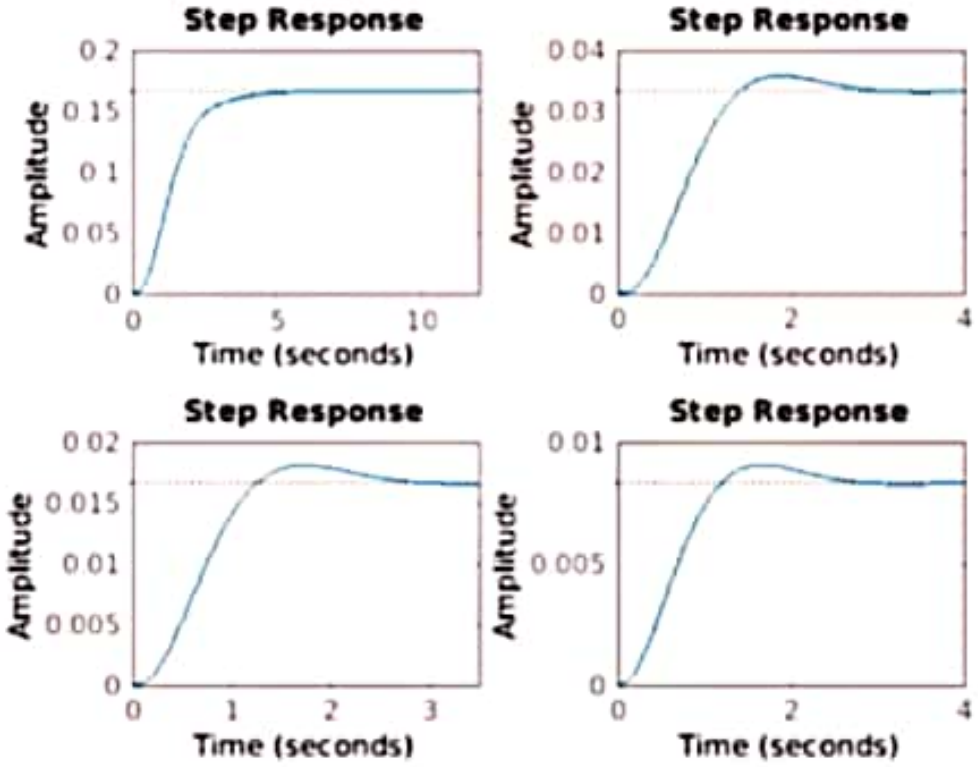
```
sys_closed =

           1
  --------------------
  s^3 + 2 s^2 + s + 1

Continuous-time transfer function.


Gm =

     2


Pm =

   21.3877


Wcg =

     1


Wcp =

    0.6823


S =

  struct with fields:

        RiseTime: 1.7271
    SettlingTime: 30.9388
     SettlingMin: 0.6759
     SettlingMax: 1.5435
       Overshoot: 54.3517
      Undershoot: 0
            Peak: 1.5435
        PeakTime: 4.7761
```

```
% Effect of addition on closed loop poles
sys = tf([1], [1 3 6])
p = [-1 -5 -10 -20]
for i=1:4
    sys_new = tf([1], [1 -p(i)])*sys
    subplot(2, 2, i)
    step(sys_new)
    stepinfo(sys_new)
end
```

```
sys =

          1
  -------------
  s^2 + 3 s + 6

Continuous-time transfer function.


p =

    -1    -5   -10   -20


sys_new =

              1
  ----------------------
  s^3 + 4 s^2 + 9 s + 6

Continuous-time transfer function.


ans =

  struct with fields:

        RiseTime: 2.0388
    SettlingTime: 4.3619
     SettlingMin: 0.1503
     SettlingMax: 0.1667
       Overshoot: 0
      Undershoot: 0
            Peak: 0.1667
        PeakTime: 12.8484


sys_new =

              1
  ----------------------
```

```
  s^3 + 8 s^2 + 21 s + 30

Continuous-time transfer function.


ans =

  struct with fields:

        RiseTime: 0.8705
    SettlingTime: 2.6518
     SettlingMin: 0.0301
     SettlingMax: 0.0358
       Overshoot: 7.4106
      Undershoot: 0
            Peak: 0.0358
        PeakTime: 1.8789


sys_new =

              1
  -------------------------
  s^3 + 13 s^2 + 36 s + 60

Continuous-time transfer function.


ans =

  struct with fields:

        RiseTime: 0.7990
    SettlingTime: 2.5417
     SettlingMin: 0.0152
     SettlingMax: 0.0181
       Overshoot: 8.4569
      Undershoot: 0
            Peak: 0.0181
        PeakTime: 1.7500


sys_new =

              1
  -------------------------
  s^3 + 23 s^2 + 66 s + 120

Continuous-time transfer function.


ans =

  struct with fields:
```

```
    RiseTime: 0.7770
SettlingTime: 2.4869
 SettlingMin: 0.0076
 SettlingMax: 0.0091
   Overshoot: 8.6970
  Undershoot: 0
        Peak: 0.0091
    PeakTime: 1.6886
```



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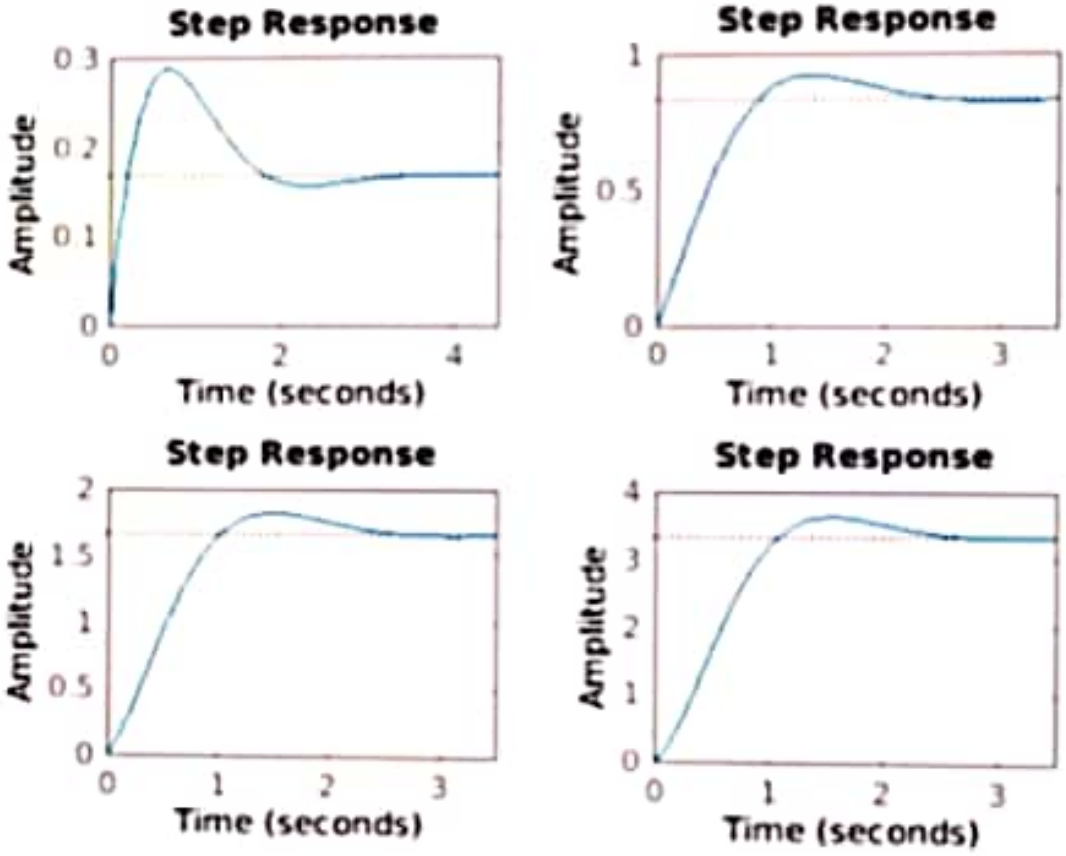
```
% Effect of addition on closed loop zeroes
sys = tf([1], [1 3 6])
z = [-1 -5 -10 -20]
for i=1:4
    sys_new = tf([1 -z(i)], [1])*sys
    subplot(2, 2, i)
    step(sys_new)
    stepinfo(sys_new)
end
```

```
sys =

          1
  -------------
  s^2 + 3 s + 6

Continuous-time transfer function.


z =

    -1    -5   -10   -20


sys_new =

       s + 1
  -------------
  s^2 + 3 s + 6

Continuous-time transfer function.


ans =

  struct with fields:

        RiseTime: 0.1658
    SettlingTime: 3.0252
     SettlingMin: 0.1508
     SettlingMax: 0.2867
       Overshoot: 72.0403
      Undershoot: 0
            Peak: 0.2867
        PeakTime: 0.6754


sys_new =

       s + 5
  -------------
```

```
  s^2 + 3 s + 6

Continuous-time transfer function.


ans =

  struct with fields:

        RiseTime: 0.6566
    SettlingTime: 2.2140
     SettlingMin: 0.7514
     SettlingMax: 0.9198
       Overshoot: 10.3779
      Undershoot: 0
            Peak: 0.9198
        PeakTime: 1.3508


sys_new =

     s + 10
  -------------
  s^2 + 3 s + 6

Continuous-time transfer function.


ans =

  struct with fields:

        RiseTime: 0.7398
    SettlingTime: 2.3284
     SettlingMin: 1.5323
     SettlingMax: 1.8183
       Overshoot: 9.0973
      Undershoot: 0
            Peak: 1.8183
        PeakTime: 1.5044


sys_new =

     s + 20
  -------------
  s^2 + 3 s + 6

Continuous-time transfer function.


ans =

  struct with fields:
```

```
     RiseTime: 0.7623
 SettlingTime: 2.3834
   SettlingMin: 3.0030
   SettlingMax: 3.6282
    Overshoot: 0.8459
   Undershoot: 0
         Peak: 3.6282
     PeakTime: 1.5658
```



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