PID for a double integrator (0.5/s^2)

Videos:

https://personales.upv.es/asala/YT/V/dintPIDplace.html [Spanish]

https://personales.upv.es/asala/YT/V/dintPIDplaceEN.html [English]

```
syms s %Symbolic Toolbox
vpa(expand((s+1.2)^3),5) %desired polynomial
```

ans = $s^3 + 3.6\,s^2 + 4.32\,s + 1.728$

```
s=tf('s'); %Control Toolbox
%Theory is in a handwritten annex.
G=2/s^2;
Kp=4.32/2;
Kd=3.6/2;
Kib=1.728/2;
K=(Kd*s^2+Kp*s+Kib)/s;
CLref=feedback(G*K,1) %setpoint to output TF
```

```
CLref =

     3.6 s^2 + 4.32 s + 1.728
  ------------------------------
  s^3 + 3.6 s^2 + 4.32 s + 1.728

Continuous-time transfer function.
Model Properties
```

```
zpk(CLref)
```

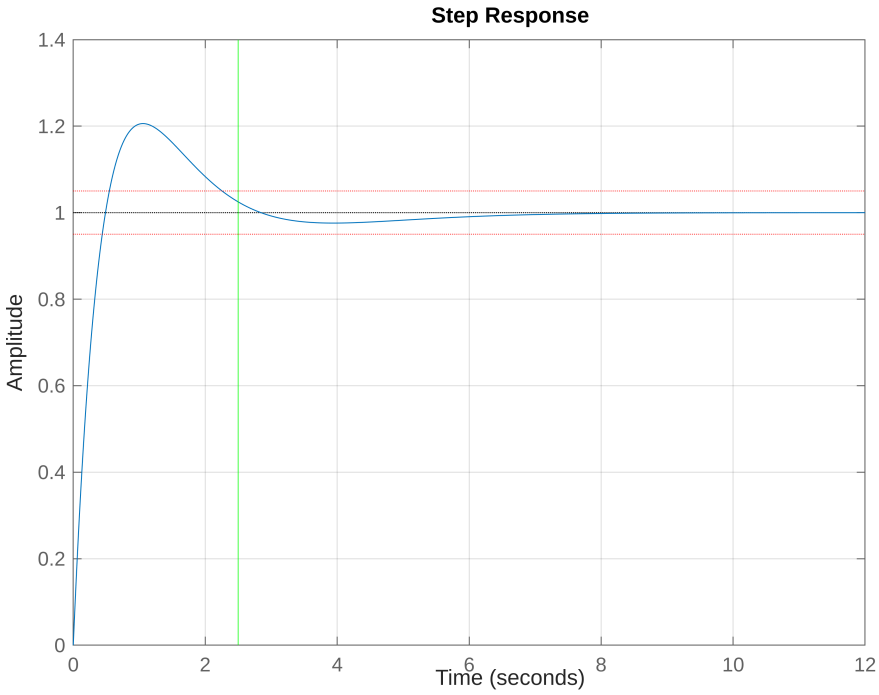
```
ans =

  3.6 (s^2 + 1.2s + 0.48)
  -----------------------
         (s+1.2)^3

Continuous-time zero/pole/gain model.
Model Properties
```

```
CLdu=feedback(G,K); %input disturbance to output TF
zpk(CLdu)
```

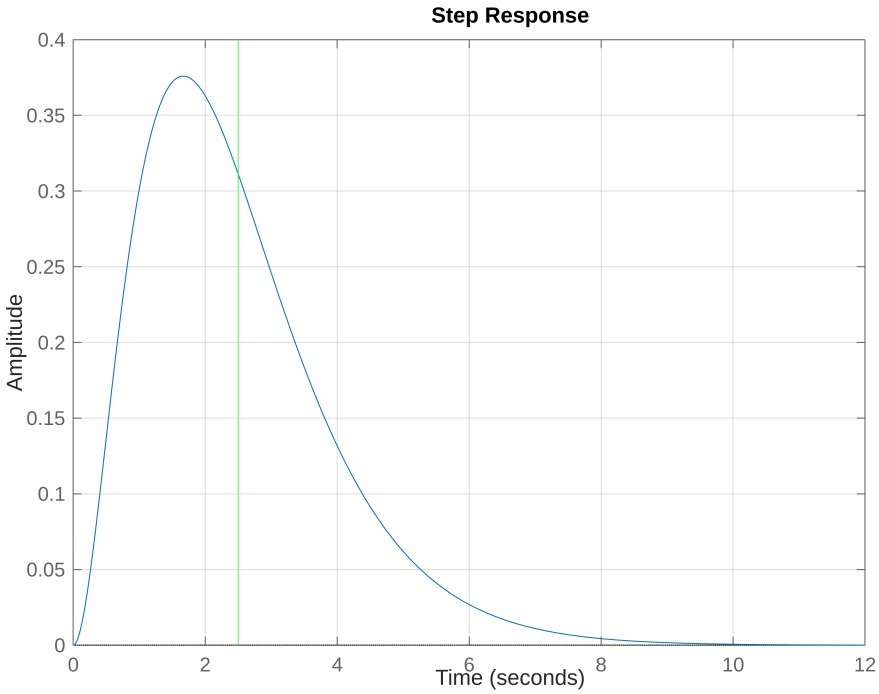
```
ans =

     2 s
  ---------
  (s+1.2)^3

Continuous-time zero/pole/gain model.
Model Properties
```

```
step(CLref), grid on, xline(2.5,'g')
```

```
yline([0.95 1.05],'r:')
```




```
step(CLdu), grid on, xline(2.5,'g')
```



To change to "ideal form" $K_c \cdot (1 + T_d s + K_i \frac{1}{s})$.

```
Kc=Kp
```

```
Kc = 2.1600
```

```
Ki=Kib/Kc
```

```
Ki = 0.4000
```

```
Td=Kd/Kc
```

```
Td = 0.8333
```

```

```