```
1 !pip install -U control
```

```
   Collecting control
     Downloading https://files.pythonhosted.org/packages/88/87/ee6cb7cdcf4efe5634231bd68
          |████████████████████████████████| 348kB 5.5MB/s
   Requirement already satisfied, skipping upgrade: numpy in /usr/local/lib/python3.7/di
   Requirement already satisfied, skipping upgrade: scipy in /usr/local/lib/python3.7/di
   Requirement already satisfied, skipping upgrade: matplotlib in /usr/local/lib/python3
   Requirement already satisfied, skipping upgrade: cycler>=0.10 in /usr/local/lib/pytho
   Requirement already satisfied, skipping upgrade: pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2
   Requirement already satisfied, skipping upgrade: python-dateutil>=2.1 in /usr/local/l
   Requirement already satisfied, skipping upgrade: kiwisolver>=1.0.1 in /usr/local/lib/
   Requirement already satisfied, skipping upgrade: six in /usr/local/lib/python3.7/dist
   Building wheels for collected packages: control
     Building wheel for control (setup.py) ... done
     Created wheel for control: filename=control-0.9.0-py2.py3-none-any.whl size=344920
     Stored in directory: /root/.cache/pip/wheels/35/be/ee/081b68ca3e4b2d253fba2f7f7e519
   Successfully built control
   Installing collected packages: control
   Successfully installed control-0.9.0
```

Sobre a biblioteca que estamos lidando [Mais informações aqui](#).

```
1 import numpy as np
2 import matplotlib.pyplot as plt
3 import control as co
```

```
1 G1 = co.tf([2,5],[1,2,3])
2 G1
```

$$\frac{2s+5}{s^2+2s+3}$$

Função Transferência com ganho, polos e zeros

```
1 G2 = 5*co.tf(np.poly([-2,-5]),np.poly([-4,-5,-9]))
2 G2
```

$$\frac{5s^2+35s+50}{s^3+18s^2+101s+180}$$

```
1 G3 = G1*G2
2 G3
```

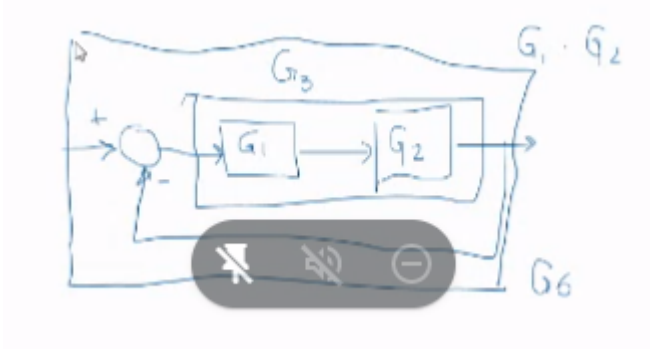$$\frac{10s^3+95s^2+275s+250}{s^5+20s^4+140s^3+436s^2+663s+540}$$

```
1 G4 = G1 + G2
2 G4
```

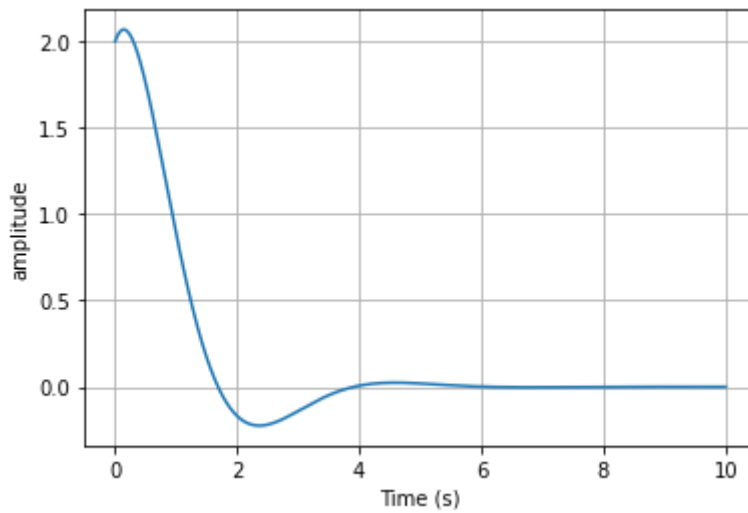$$\frac{7s^4+86s^3+427s^2+1070s+1050}{s^5+20s^4+140s^3+436s^2+663s+540}$$

```
1 G6 = co.feedback(G1,G2)
2 G6
```

$$\frac{2s^4+41s^3+292s^2+865s+900}{s^5+20s^4+150s^3+531s^2+938s+790}$$


```
1 t = np.linspace(0,10,1000)
2 t1, y1 = co.impulse_response(G1,t)
3
4 plt.plot(t1,y1)
5 plt.xlabel("Time (s)")
6 plt.ylabel("amplitude")
7 plt.grid()
```

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