Se nos da la siguiente funcion de transferencia

$$G_0=\frac{3}{s^2+2s+1}$$

Se usa la siguiente formula de retroalimentación:

$$Feedback=\frac{G_0}{1+G_0*H_0}$$

1) Se hace el Feedback:

$$\frac{\frac{3}{s^2+2s+1}}{1+\frac{3}{s^2+2s+1}*1} \quad = \quad \frac{\frac{3}{s^2+2s+1}}{\frac{s^2+2s+3+1}{s^2+2s+1}} \quad = \quad \frac{3}{s^2+2s+4}$$

$$= \quad \left(\frac{3}{4}\right)\left(\frac{4}{s^2+2s+4}\right)$$

Se usa la formula:

$$\frac{\omega_n^2}{s^2+2\zeta\omega_n s+\omega_n^2}=\left(\frac{3}{4}\right)\left(\frac{4}{s^2+2s+4}\right)$$

2) Se calcula ω_n^2

$$\omega_n^2=4 \quad = \quad \sqrt{\omega_n^2}=\sqrt{4} \quad = \quad \omega_n=2$$

3) Se calcula ζ

$$\zeta\omega_n=1 \quad = \quad \zeta 2=1 \quad = \quad \zeta=\frac{1}{2}$$

4) Se calcula Ceros y Polos
Ceros=

$$Z=\emptyset$$

Polos=

$$\alpha=\zeta\omega_n \quad = \quad \alpha=\frac{1}{2}*2 \quad = \quad \alpha=1$$

$\omega = \omega_n \sqrt{1-(\zeta)^2}$ = $\omega = 2\sqrt{1-(\frac{1}{2})^2}$ $\omega = \sqrt{3}$

Segun la formula general $s = -\zeta\omega \pm \sqrt{\omega^2(\zeta^2-1)}$

Los polos quedan

$$P_1 = -1+\sqrt{3}$$

$$P_2 = -1-\sqrt{3}$$

5)Verificacion en Octave

```
octave:10> num=[3];
octave:11> den=[1 2 1];
octave:12> G=tf(num,den)

Transfer function 'G' from input 'u1' to output ...

             3
 y1:  -------------
      s^2 + 2 s + 1

Continuous-time model.
octave:13> H=tf([1],[1])

Transfer function 'H' from input 'u1' to output ...

 y1:  1

Continuous-time model.
octave:14> feedback(G,H)

Transfer function 'ans' from input 'u1' to output ...

             3
 y1:  -------------
      s^2 + 2 s + 4

Continuous-time model.
```

```
octave:15> [z,p,k]=tf2zp([3],[1,2,4])
z = [](0x1)
p =

  -1.0000 + 1.7321i
  -1.0000 - 1.7321i

k =  3
```