UNIVERSIDAD FIDELITAS

Escuela de Ingeniería Eléctrica

Control automático

Tarea#2

Sistemas de segundo orden

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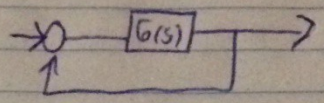
Parte realizada en matlab:

```
>> num=[3]

num = 3


>> den=[1 2 1]

den = 1     2     1

>> tf(num,den)

ans =

         3

  -------------

  s^2 + 2 s + 1

Continuous-time transfer function.

>> G=tf(num,den)

G =

          3

  -------------

  s^2 + 2 s + 1

 Continuous-time transfer function.

>> H=[1]

H =  1

>> feedback(G,H)

ans =

        3

  -------------

  s^2 + 2 s + 4
```

```
 Continuous-time transfer function.
>> [Z,P,K]=tf2zp(num,den)
Z =
   Empty matrix: 0-by-1
P =
    -1
    -1
K =
     3
     >> z=[0.5]
z =
    0.5000
>> wn=[2]
wn =
     2
>> zgrid(z,wn)
```

Parte realizada a mano:

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



Feedback

$$\frac{\frac{3}{s^2+2s+1}}{\frac{s^2+2s+4}{s^2+2s+1}} \Rightarrow \frac{3}{s^2+2s+4}$$

$$\frac{\omega_n^2}{s^2+2\zeta\omega_n s+\omega_n^2} = \frac{3}{s^2+2s+4}$$

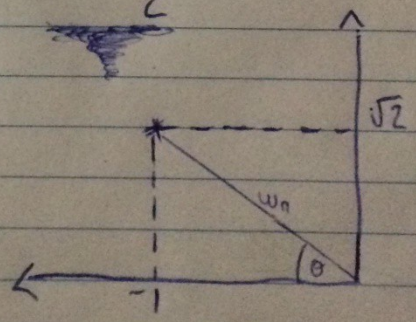
$$\frac{3 * \frac{4}{4}}{s^2+2s+4} \Rightarrow \frac{3}{4} * \frac{4}{s^2+2s+4}$$

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

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

Donde

$$\alpha = -\zeta\omega_n$$
$$\alpha = -1$$



$$\omega = \omega_n\sqrt{1-\zeta^2} \Rightarrow \omega = 2\left(\sqrt{+1-\frac{1}{2}}\right)$$
$$\omega = \sqrt{2} \approx 1{,}41$$