## Find A and ϕ for w=1 and 4

$$\frac{dy}{dt} + 3y = \sin\omega t \quad \Rightarrow \quad y = A\sin(\omega t + \phi)$$



Find the gain and phase in terms of w and hence find y(t) when Y(s)=G(s)U(s) for w=6 with G(s)=8/(s+7)



$$G(s) = \frac{4}{s+0.3} \quad \Rightarrow \quad y(t) = A\cos(wt + \phi)$$

$$u(t) = \cos(0.1\sqrt{3}\, t)$$



## Given G(s)=3/(s+2), find y(t) for the following u(t).

$$G(s) = \frac{3}{s+2} \quad \Rightarrow \quad G(j\omega) =$$

$$u(t) = \sin(2t) \quad \Rightarrow$$

$$u(t) = \cos(4t) \quad \Rightarrow$$

$$u(t) = 2.8 \quad \Rightarrow$$



## Given G(s)=2(0.5+s)/(2+s), find the gain and phase for w=4.



## Find the gain and phase

NOTE: Integrators have a fixed argument of pi/2

$$G(s) = \frac{(s+2)}{(s+3)}$$

$$G(s) = \frac{(s+2)}{(s+3)(s+4)}$$

$$G(s) = \frac{(s+1)(s+2)}{(s+3)(s+4)}$$

$$G(s) = \frac{4}{s(s+4)}$$

By first plotting the argand diagram for each factor, find the phase for:

$$(s-2)$$

$$\frac{1}{s-1}$$

$$(2-s)$$

$$\frac{s-1}{3-s}$$

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Given G(s) and a sinusoidal input signal u(t) whose amplitude is 1 and frequency is 2(rad/s).

$$G(s)=\frac{5}{1+0.5s}$$

- Compute the corresponding steady-state output y(t).
- What is the gain and phase of the process at this frequency ?
- What is the gain and phase for frequencies of 4, 6, 8 and 10 rad/s. Sketch how the gain and phase depend upon frequency.

Repeat the above with the following examples:

$$G(s)=\frac{(s+1)}{(s+4)(s+2)};\quad G(s)=\frac{3}{(s+10)(s+1)(s+3)};\quad G(s)=\frac{1}{s(s+1)}$$

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