ECE 447: Contro Systems (Fall 2020)

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*if/when possible: keep video on; unmute to ask Questions

* update your preferred name at identity.uw.edu

today:
- ☐ HW1 assigned — due Fri Oct 16
    * Euler's formula

- ☐ week 2 lectures posted (~1 hr 20 min)

- ☐ office hour
    ⟶ Colabocatory notebook

Euler's formula

$$u_1(t) = \cos t = \operatorname{Re}(e^{it}) = \frac{e^{it} + e^{-it}}{2},$$
$$u_2(t) = \sin t = \operatorname{Im}(e^{it}) = \frac{e^{it} - e^{-it}}{2i}.$$

$\xrightarrow{\;G\;}$

$$y_1(t) = \frac{1}{2}\left(G(i)e^{it} + G(-i)e^{it}\right)$$

$$y_2(t) = \frac{1}{2i}\left(G(i)e^{it} - G(-i)e^{it}\right)$$

· if 1 input $u(t) = e^{st}$, $s \in \mathbb{C}$

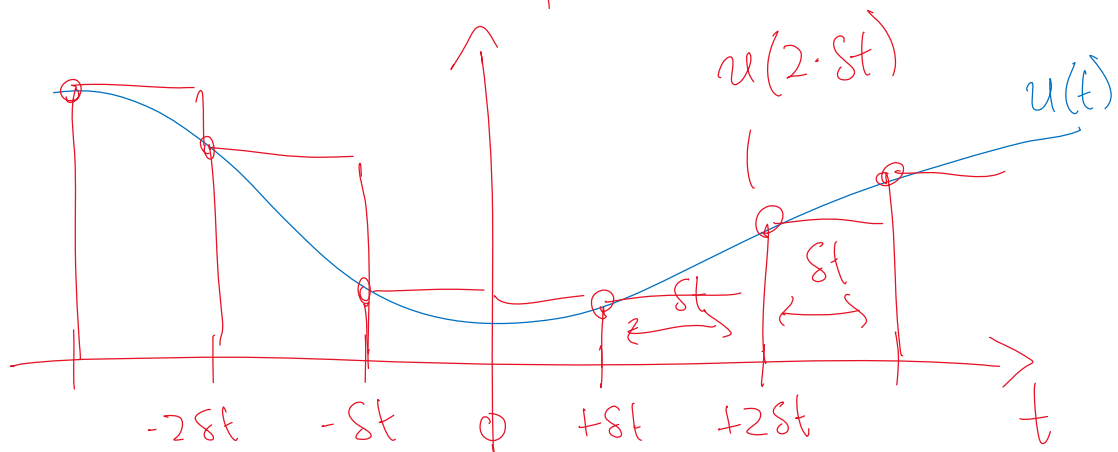$$u : (-\infty, \infty) \to \mathbb{C}$$

the output $u(t) = G(s)e^{st}$

the output $y(t) = G(s) e^{st}$

$$y : (-\infty, \infty) \to \mathbb{C}$$

$u \xrightarrow{\mathcal{F}} \hat{u}$

$$\hat{u}(s) = \int_{-\infty}^{\infty} u(t) e^{\pm st} dt$$

$$\simeq \sum_{k=-\infty}^{+\infty} u(k \cdot \delta t) \cdot e^{\pm s \cdot \delta t} \cdot \delta t$$

$$G_{yr} = \frac{PC}{1+PC} \xrightarrow{1.1 \times P} \frac{1.1\, PC}{1 + 1.1 PC} = \tilde{G}_{yr}$$

$*$ P, C could be $\in \mathbb{C}$ or even negative, in which case it's not clear how $|G_{yr}|$ changes

$*$ in the case $P, C > 0$ then:

$$PC \to \infty \implies \tilde{G}_{yr} \to G_{yr}$$

$$PC \longrightarrow \infty \implies G_{gyr} \longrightarrow G_{gyr}$$

$$PC \longrightarrow 0 \implies \tilde{G}_{gyr} \longrightarrow 0 \quad \left(G_{gyr} \longrightarrow 0 \dots \right)$$

$|\tilde{G}_{gyr}|$

1

O

$PC \in \mathbb{R}$