Day 32

Frequency response (platform demo)

AE353

Spring 2022

Bretl

33.41

35.329 32.96 39.72

35.997 33.41

ω	MAG	ANG
1	1.12	-0.45
2	1.22	-1.34
5	0.22	-2.76

7.142

8.394

6.593

$$\dot{x} = Ax + Bu$$
$$u = u_{des} - K(x - x_{des})$$

$$x_{des} = \begin{bmatrix} q_{des} \\ 0 \end{bmatrix} = \underbrace{\begin{bmatrix} 1 \\ 0 \end{bmatrix}}_{M} \underbrace{[q_{des}]}_{r}$$

$$\dot{x} = Ax + B(u_{des} - K(x - Mr))$$
$$= (A - BK)x + \underbrace{Bu_{des}}_{-Ax_{des} = -AMr} + BKMr$$

$$0 = Ax_{des} + Bu_{des}$$

$$\dot{x} = (A - BK)x - (A - BK)Mr$$
$$y = M^T x$$

$$\dot{x}_m = A_m x_m + B_m u_m$$
$$y_m = C_m x_m$$

General Result

$$u_m(t) = \sin(\omega t) \Rightarrow y_m(t) = (\cdots) + |H(j\omega)| \sin(\omega t + \angle H(j\omega))$$
$$u_m(t) = \cos(\omega t) \Rightarrow y_m(t) = (\cdots) + |H(j\omega)| \cos(\omega t + \angle H(j\omega))$$

magnitude — angle

a complex number

$$H(s) = C_m (sI - A_m)^{-1} B_m$$

← TRANSFER FUNCTION

another complex number