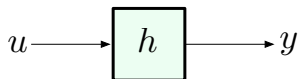


Frequency Response



$u(t) = A \cos(\omega t)$ A – amplitude; ω – (angular) frequency, rad/s

From Euler's formula:

$$A \cos(\omega t) = \frac{A}{2} (e^{j\omega t} + e^{-j\omega t})$$

By linearity, the response is

$$y(t) = \frac{A}{2} \left(H(j\omega) e^{j\omega t} + H(-j\omega) e^{-j\omega t} \right)$$

where $H(j\omega) = \int_0^{\infty} h(\tau) e^{-j\omega\tau} d\tau$

$$H(-j\omega) = \int_0^{\infty} \underbrace{h(\tau) e^{j\omega\tau}}_{\substack{\text{complex} \\ \text{conjugate}}} d\tau = \overline{H(j\omega)}$$

(recall that $h(\tau)$ is real-valued)