

# 频率响应例1

**例1:** 某系统的微分方程为

$$y'(t) + 2y(t) = f(t)$$

求 $f(t) = e^{-t}\varepsilon(t)$ 时的响应 $y(t)$ 。

**解:** 微分方程两边取傅里叶变换

$$j\omega Y(j\omega) + 2Y(j\omega) = F(j\omega) \quad H(j\omega) = \frac{Y(j\omega)}{F(j\omega)} = \frac{1}{j\omega + 2}$$

$$f(t) = e^{-t}\varepsilon(t) \longleftrightarrow F(j\omega) = \frac{1}{j\omega + 1}$$

$$Y(j\omega) = H(j\omega)F(j\omega) = \frac{1}{(j\omega + 1)(j\omega + 2)} = \frac{1}{j\omega + 1} - \frac{1}{j\omega + 2}$$

$$y(t) = (e^{-t} - e^{-2t})\varepsilon(t)$$