EG-247 Example 1

AM — Amplitude modulation

compute the result of multiplying a signal $f(t)$ by carrier $\cos \omega_c t$

$$f(t)\cos\omega_c t \iff F(\omega) * \mathcal{F}(\cos\omega_c t)$$

↓

Multiplication in Time domain

$$\cos\omega_c t = \left[\frac{e^{j\omega_c t} + e^{-j\omega_c t}}{2}\right]$$ Euler's Identity.

$$\frac{f(t)e^{j\omega_c t} + f(t)e^{-j\omega_c t}}{2}$$

Valid because Fourier transform linearity.

frequency shift. $e^{j\omega_0 t} \cdot f(t) = F(\omega - \omega_0)$

$$\frac{F(w-w_c) + F(w+w_c)}{2}$$