5.3.4 Taajuussiirto-ominaisuus

Jos $\mathcal{F}\{f(t)\} = F(\mathrm{j}\omega)$

niin $\mathcal{F}\{\mathrm{e}^{\mathrm{j}\omega_0 t} f(t)\} = F(\mathrm{j}(\omega - \omega_0))$ (5.26)

sillä

$$\mathcal{F}\{\mathrm{e}^{\mathrm{j}\omega_0 t} f(t)\} = \int_{-\infty}^{\infty} \mathrm{e}^{\mathrm{j}\omega_0 t} f(t)\, \mathrm{e}^{-\mathrm{j}\omega t}\, dt =$$

$$= \int_{-\infty}^{\infty} f(t)\, \mathrm{e}^{-\mathrm{j}(\omega-\omega_0)t}\, dt =$$

$$= F(\mathrm{j}(\omega - \omega_0))$$

"The result (5.26) is known as the **frequency-shift property**, and indicates that multiplication by $\mathrm{e}^{\mathrm{j}\omega_0 t}$ simply shifts the spectrum of $f(t)$ so that it is centered on the point $\omega = \omega_0$ in the frequency domain. This phenomena is the mathematical foundation for the process of **modulation** in communication theory, illustrated in Example 5.7."