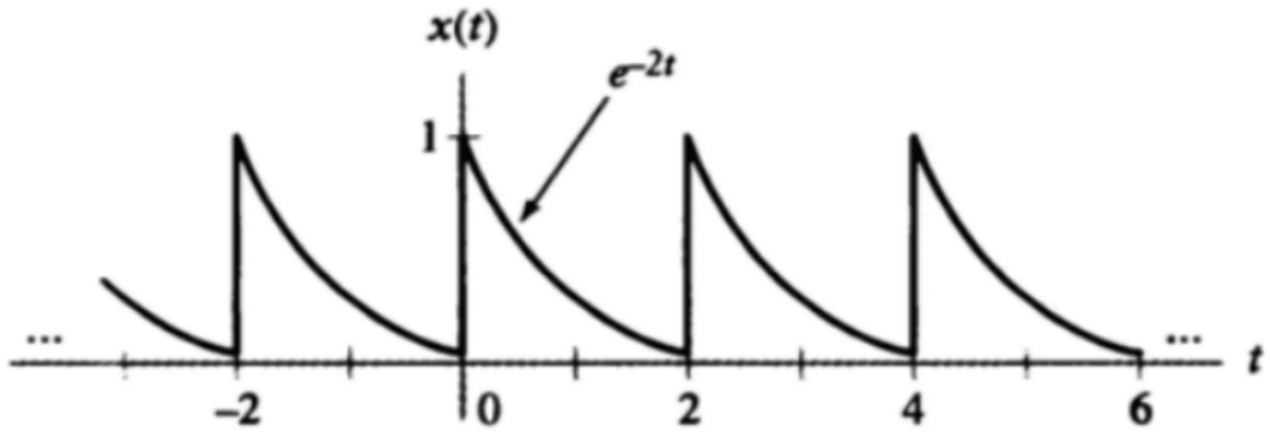
5)

Encontre os coeficientes da representação de Fourier do sinal periódico abaixo: pulsos com período T = 2 com função e^(-2t).



Representação: Série de Fourier

$$X[k] = \frac{1}{T}\int_0^T x(t)\, e^{-jk\omega_0 t}\, dt$$

$$T = 2 \quad ; \quad x(t) = e^{-2t} \quad ; \quad \omega_0 = \frac{2\pi}{T} = \pi$$

$$\Rightarrow X[k] = \frac{1}{2}\int_0^2 e^{-2t}\cdot e^{-jk\pi t}\, dt$$

$$= \frac{1}{2}\int_0^2 e^{t(-2-jk\pi)}\, dt = \frac{1}{2(-2-jk\pi)}\cdot e^{t(-2-jk\pi)}\Big|_0^2$$

$$= \frac{1}{-(4+jk\pi)}\cdot\left[e^{-4-j2k\pi} - 1\right] = \frac{1}{(4+jk\pi)}\cdot\left[1 - e^{-4}\cdot e^{-j2\pi k}\right]$$

$e^{-j2\pi k} = 1$

$$\therefore X[k] = \frac{1 - e^{-4}}{(4+j\pi\cdot k)}$$