56) $g(t) = e^t \quad 0 \le t < T$ $\qquad \omega = \frac{2\pi}{T^*} = \frac{2\pi}{2T} = \frac{\pi}{T}$

$$h(t) = \begin{cases} g(t) & 0 \le t < T \\ g(-t) & -T < t < 0 \end{cases} \qquad h(t+2T) = h(t)$$

$$a_n = \frac{1}{T} \cdot \left(\int_{-T}^{0} e^{-t} \cdot \cos(\overset{\omega}{n}t)\, dt + \int_{0}^{T} e^{t} \cdot \cos(\overset{\omega}{n}t)\, dt \right) =$$

$$= \frac{1}{T} \cdot \Big[-\frac{1}{\omega^2 n^2 + 1} - \cancel{\frac{\omega n}{\omega^2 n^2 + 1} \cdot \sin(-n\cdot\pi) \cdot e^T} + \frac{1}{\omega^2 n^2 + 1} \cdot \cos(-n\cdot\pi) \cdot e^T$$

$$+ \cancel{\frac{\omega n}{\omega^2 n^2 + 1} \cdot \sin(n\pi) \cdot e^T} + \frac{1}{\omega^2 n^2 + 1} \cdot \cos(n\pi) \cdot e^T$$

$$- \cancel{\frac{\omega n}{\omega^2 n^2 + 1} \cdot \sin(0)} - \frac{1}{\omega^2 n^2 + 1} \Big]$$

$$= \frac{1}{T} \cdot \left[-\frac{2}{\omega^2 n^2 + 1} + \frac{2}{\omega^2 n^2 + 1} \cdot \cos(n\pi) \cdot e^T \right]$$

$$\Rightarrow a_n = \begin{cases} \frac{1}{T} \cdot \left[-\frac{2}{\omega^2 n^2 + 1} - \frac{2}{\omega^2 n^2 + 1} \cdot e^T \right] & \text{wenn } n \text{ ungerade} \\ \frac{1}{T} \cdot \left[-\frac{2}{\omega^2 n^2 + 1} + \frac{2}{\omega^2 n^2 + 1} \cdot e^T \right] & \text{wenn } n \text{ gerade} \end{cases}$$

$b_n = 0$ weil $h(t)$ gerade Fkt.

$$\Rightarrow \boxed{S_f(t) = \frac{1}{T} \cdot \left[e^T - 1 \right] + \sum_{n=1}^{\infty} a_n \cdot \cos(n\omega t)}$$

$$\int \underbrace{e^{-t}}_{u} \cdot \underbrace{\cos(n\omega t)}_{dv} = \frac{1}{n\omega}\sin(n\omega t)\cdot e^{-t} + \frac{1}{n\omega}\int \underbrace{e^{-t}}_{u}\cdot \underbrace{\sin(n\omega t)}_{dv}\, dt =$$

$u = e^{-t} \Rightarrow du = -e^{-t}\,dt$ $\qquad$ $dv = \sin(n\omega t)_{dt} \Rightarrow v = -\frac{1}{n\omega}\cos(n\omega t)$

$dv = \cos(n\omega t)\,dt \Rightarrow v = \frac{1}{\omega n}\cdot\sin(n\omega t)$

$$= \frac{1}{n\omega}\sin(n\omega t)\cdot e^{-t} + \frac{1}{\omega n}\cdot\left[-\frac{1}{\omega n}\cdot\cos(n\omega t)\cdot e^{-t} - \frac{1}{\omega n}\cdot\int e^{-t}\cdot\cos(n\omega t)\,dt\right]$$

$$\left[\int e^{-t}\cdot\cos(n\omega t)\right]\cdot\left(1+\frac{1}{\omega^2 n^2}\right) = \frac{1}{\omega n}\cdot\sin(n\omega t)\cdot e^{-t} - \frac{1}{\omega^2 n^2}\cdot\cos(n\omega t)\cdot e^{-t} \Big/ \cdot \frac{1}{1+\frac{1}{\omega^2 n^2}}$$

$$\int e^{-t}\cdot\cos(n\omega t) = \frac{1}{\omega n + \frac{1}{\omega n}}\cdot\sin(n\omega t)\cdot e^{-t} - \frac{1}{\omega^2 n^2 + 1}\cdot\cos(n\omega t)\cdot e^{-t} \qquad (\cdot\,\omega n$$

$$= \underline{\frac{\omega n}{\omega^2 n^2 + 1}\cdot\sin(n\omega t)\cdot e^{-t} - \frac{1}{\omega^2 n^2+1}\cdot\cos(n\omega t)\cdot e^{-t}}$$

$$\int \underbrace{e^{t}}_{u}\cdot\underbrace{\cos(n\omega t)}_{dv} = \frac{1}{\omega n}\cdot\sin(n\omega t)\,e^{t} - \frac{1}{\omega n}\int \underbrace{e^{t}}_{u}\cdot\underbrace{\sin(n\omega t)}_{dv}\,dt =$$

$u = e^{t} \Rightarrow du = e^{t}\,dt$ $\qquad$ $dv = \sin(n\omega t)\,dt \Rightarrow v = -\frac{1}{n\omega}\cdot\cos(n\omega t)$

$dv = \cos(n\omega t)\,dt \Rightarrow v = \frac{1}{\omega n}\cdot\sin(n\omega t)$

$$= \frac{1}{\omega n}\cdot\sin(n\omega t)\cdot e^{t} - \frac{1}{\omega n}\cdot\left[-\frac{1}{n\omega}\cdot\cos(n\omega t)\,e^{t} + \frac{1}{n\omega}\int e^{t}\cdot\cos(n\omega t)\,dt\right]$$

$$\left[\int e^{t}\cdot\cos(n\omega t)\,dt\right]\cdot\left(1+\frac{1}{\omega^2 n^2}\right) = \frac{1}{\omega n}\cdot\sin(n\omega t)\,e^{t} + \frac{1}{\omega^2 n^2}\cdot\cos(n\omega t)\,e^{t} \Big/ \cdot \frac{1}{1+\frac{1}{\omega^2 n^2}}$$

$$\underline{\int e^{t}\cdot\cos(n\omega t)\,dt = \frac{\omega n}{\omega^2 n^2+1}\cdot\sin(n\omega t)\cdot e^{t} + \frac{1}{\omega^2 n^2+1}\cdot\cos(n\omega t)\cdot e^{t}}$$

$$a_0 = \frac{1}{T}\left[\int_{-T}^{0} e^{-t}\,dt + \int_{0}^{T} e^{t}\,dt\right] = \frac{1}{T}\cdot\left[-e^{-t}\Big|_{-T}^{0} + e^{t}\Big|_{0}^{T}\right] = \frac{1}{T}\cdot\left[-1 + e^{T} + e^{T} - 1\right] =$$

$$= \frac{1}{T}\cdot\left[2\cdot e^{T} - 2\right] = \frac{2}{T}\cdot\left[e^{T} - 1\right]$$