$$y_k = \frac{1}{T_3}\int_{T_3} \left(c_1 + c_2\, x(c_3 t)\right) e^{-jk\omega_3 t}\, dt$$

$$= \underbrace{\frac{c_1}{T_3}\int_{T_3} e^{-jk\omega_3 t}\, dt}_{A} + \underbrace{\frac{c_2}{T_3}\int x(c_3 t)\, e^{-jk\omega_3 t}\, dt}_{B}$$

$$A:\quad \frac{c_1}{T_3}\left[\frac{e^{-jk\omega_3 t}}{-jk\omega_3}\right]_0^{T_3}$$

$$= \frac{c_1}{T_3}\left[\cancel{\frac{e^{-jk2\pi}}{-jk\omega_3} - \frac{1}{-jk\omega_3}}\right] = 0$$

$$B:\quad \frac{c_2}{T_3}\left(\underbrace{\int_{\frac{-B-10}{c_3}}^{0} \frac{-1}{B+10}\, t\, e^{-jk\omega_3 t}\, dt}_{B_1} + \underbrace{\int_{0}^{\frac{A+10}{c_3}} \frac{2}{A+10}\, t\, e^{-jk\omega_3 t}\, dt}_{B_2}\right)$$

recall $\int u\,dv = uv - \int v\,du$

let $u = t$ $\quad dv = e^{-jk\omega_3 t}\, dt$

$du = dt$ $\quad v = \dfrac{e^{-jk\omega_3 t}}{-jk\omega_3}$

$$\int t e^{-jk\omega_3 t}\, dt = \frac{t e^{-jk\omega_3 t}}{-jk\omega_3} + \int \frac{e^{-jk\omega_3 t}}{jk\omega_3}\, dt$$