> $restart;$

> $f_n := t \to a \cdot \cos(\omega \cdot t) + b \cdot \sin(\omega \cdot t);$

$$f_n := t \to a\cos(\omega t) + b\sin(\omega t) \tag{1}$$

For omega_k ≠ omega_n:

> $y = simplify\left(\frac{1}{\omega_n}\int_0^t \sin\left(\omega_n \cdot (t-s)\right)\cdot f_n(s)\, \mathrm{d}s\right);$

$$y = \frac{-a\cos(\omega t)\,\omega_n - b\sin(\omega t)\,\omega_n + a\cos(\omega_n t)\,\omega_n + b\sin(\omega_n t)\,\omega}{\omega_n\left(\omega^2 - \omega_n^2\right)} \tag{2}$$

For omega_k = omega_n:

> $y = simplify\left(\frac{1}{\omega}\int_0^t \sin(\omega \cdot (t-s))\cdot f_n(s)\, \mathrm{d}s\right);$

$$y = \frac{1}{2}\,\frac{(a\,\omega\,t + b)\,\sin(\omega t) - b\cos(\omega t)\,\omega\,t}{\omega^2} \tag{3}$$