$$\mathcal{L}\{f(t)\} = \int_0^\infty f(t)\, e^{-st}\, dt \Rightarrow F(s)$$

$$\mathcal{L}^{-1}\{F(s)\} = \int_{a-i\infty}^{a+i\infty} e^{st} F(s)\, ds \Rightarrow f(t)$$

$$\mathcal{L}\{f'(t)\} = sF(s) - f(0)$$

$$\mathcal{L}\left\{\int_0^t f(\tau)\, d\tau\right\} = \frac{F(s)}{s}$$

$$\mathcal{L}^{-1}\left\{\int_s^\infty F(\sigma)\, d\sigma\right\} = \frac{f(t)}{t}$$

$$\mathcal{L}\{e^{at} f(t)\} = F(s-a)$$

$$\mathcal{L}^{-1}\{e^{-as} F(s)\} = f(t-a)$$

$$\mathcal{L}^{-1}\{F(s)\,G(s)\} = f(t) * g(t)$$

convolución

$$f(t) * g(t) = \int_0^t f(\tau) \cdot g(t-\tau)\, d\tau$$

$$\mathcal{L}^{-1}\left\{\frac{as}{(s^2+a^2)^2}\right\}$$

$$\mathcal{L}^{-1}\left\{\frac{s}{(s^2+a^2)}\cdot\frac{a}{(s^2+a^2)}\right\} = \cos(at) * \operatorname{sen}(at)$$

$$\cos(at) * \operatorname{sen}(at) = \int_0^t \cos(az)\cdot \operatorname{sen}\left(a(t-z)\right) dz$$

$$= \left[\int \cos(az)\left[\operatorname{sen}(at)\cos(az) - \cos(at)\cdot\operatorname{sen}(az)\right] dz\right]_0^t$$

$$= \left[\operatorname{sen}(at)\int \cos^2(az)\,dz - \cos(at)\int \cos(az)\operatorname{sen}(az)\,dz\right]_0^t$$

$$= \left[\operatorname{sen}(at)\int\left(\frac{1}{2}+\frac{1}{2}\cos(2az)\right)dz - \cos(at)\int \operatorname{sen}(az)\cos(az)\,dz\right]_0^t$$

$$= \left[\frac{\operatorname{sen}(at)}{2}\int dz + \frac{\operatorname{sen}(at)}{4a}\int \cos(2az)\,2a\,dz - \cos(at)\,\frac{\operatorname{sen}^2(az)}{a}\right]_0^t$$

$$= \left[\frac{\operatorname{sen}(at)}{2}z + \frac{\operatorname{sen}(at)}{4a}\operatorname{sen}(2az) - \cos(at)\,\frac{\operatorname{sen}^2 az}{a}\right]_0^t$$

$$= \frac{t\operatorname{sen}(at)}{2} + \frac{\operatorname{sen}(at)\operatorname{sen}(2at)}{4a} - \frac{\cos(at)}{2a}\operatorname{sen}^2(at)$$

$$= \frac{t\operatorname{sen}(at)}{2} + \frac{\operatorname{sen}(at)(\operatorname{sen}(at)\cos(at)}{2a} - \frac{\cos(at)}{2a}\operatorname{sen}^2(at)$$

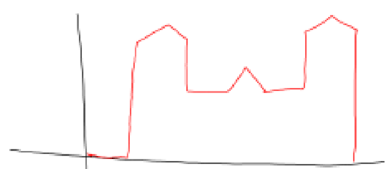
$$= \frac{t\operatorname{sen}(at)}{2}$$

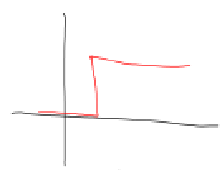
$$\mathcal{L}^{-1}\left\{\frac{s-1}{s^2+25}\right\} =$$

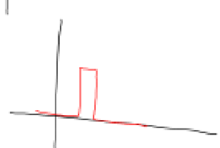
$$\mathcal{L}^{-1}\left\{\frac{s}{s^2+25} - \frac{1}{s^2+25}\right\} =$$

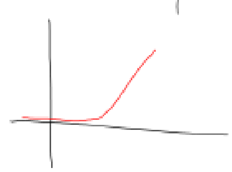
$$\mathcal{L}^{-1}\left\{\frac{s}{s^2+25}\right\} - \frac{1}{5}\mathcal{L}^{-1}\left\{\frac{5}{s^2+25}\right\} =$$

$$\cos(5t) - \frac{1}{5}\operatorname{sen}(5t)$$









$$\delta(t-a) = \begin{cases} 0 \,;\, t \neq a \\ \int_{-\infty}^{\infty} \delta(t-a)\,dt = 1 \end{cases}$$