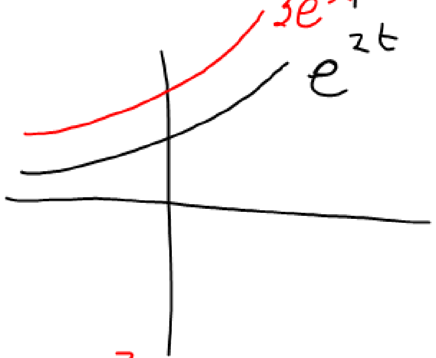
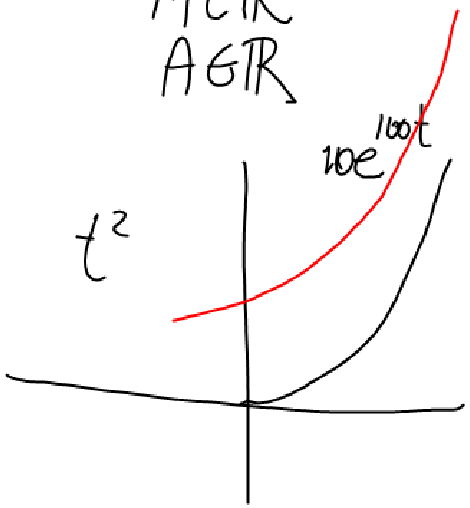
Teorema de existencia de la TL.

Una $f(t)$ tendrá TL y será única
si a) $f(t)$ es de orden exponencial
b) $f(t)$ es seccionalmente continua

Una $f(t)$ es de orden exponencial si cumple

$$f(t) \le Me^{At} \qquad M \in \mathbb{R}, \quad A \in \mathbb{R}$$

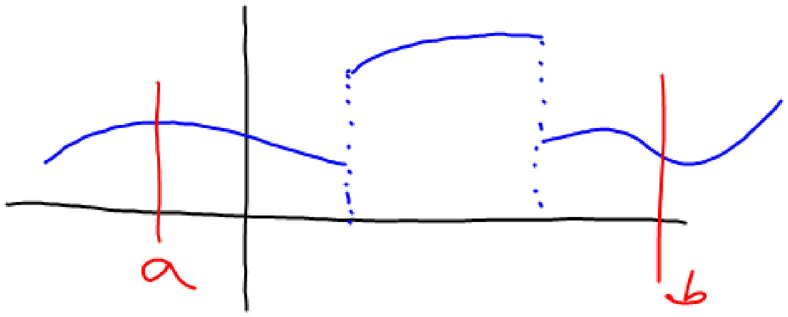


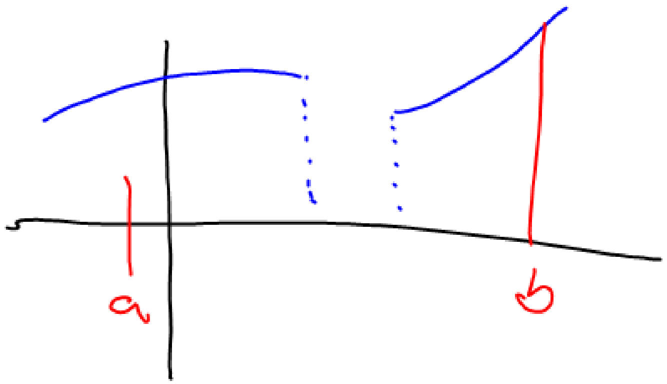


No es de O.E. $e^{-t^2} \le Me^{At}$

e^{t^n} $n \geq 2$

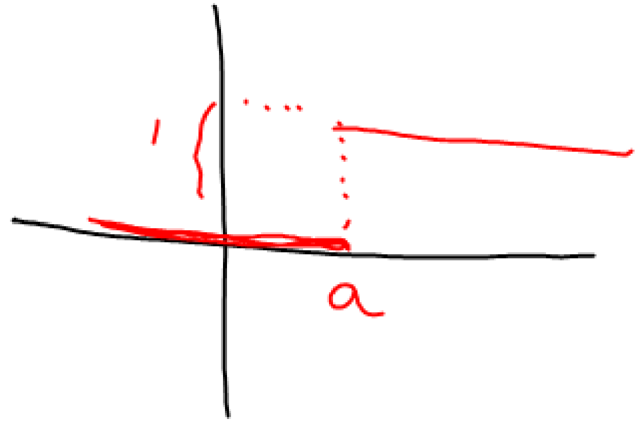
b) f(t) debe ser seccionalmente continua





Función escalón unitario.

$$u(t-a)=\begin{cases}0\ ; & t<a\\ 1\ ; & t\geq a\end{cases}$$

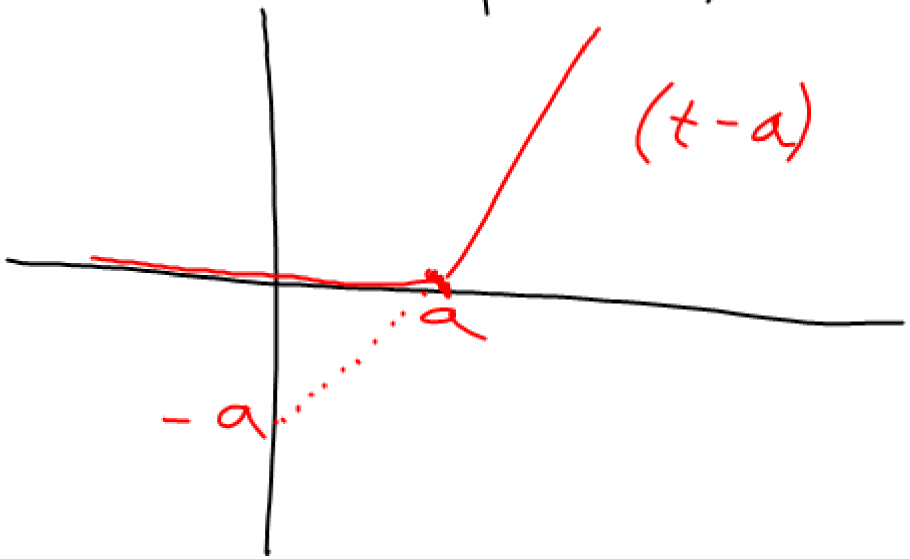


7°

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

RAMPA UNITARIA.

$$r(t-a) = \begin{cases} 0\ ; & t < a \\ (t-a)\ ; & t \geq a \end{cases}$$



$$\mathcal{L}\{u(t-a)\} = e^{-as}\mathcal{L}\{1\} \Rightarrow \frac{e^{-as}}{s}$$

$$\mathcal{L}\{r(t-a)\} = e^{-as}\mathcal{L}\{t\}$$

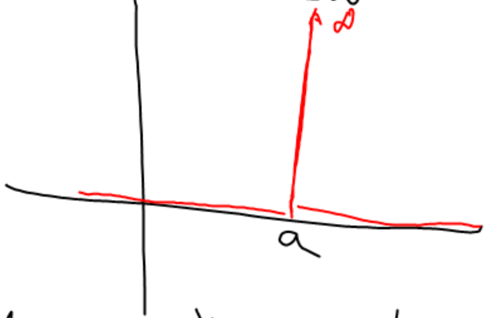
$$\mathcal{L}\left\{\frac{d}{dt} r(t-a)\right\} = s\cdot\mathcal{L}\{r(t-a)\} - \cancel{f(0)}^{\,0}$$

$$= s\left\{\frac{e^{-as}}{s^2}\right\} \Rightarrow \left\{\frac{e^{-as}}{s}\right\}$$

$$\mathcal{L}\left\{\frac{d}{dt} r(t-a)\right\} = \mathcal{L}\{u(t-a)\}$$

$$\frac{d}{dt} r(t-a) = u(t-a).$$

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



$$\mathcal{L}\left\{ \frac{d}{dt}\left(u(t-a)\right) \right\} = s\mathcal{L}\left\{ u(t-a) \right\} - f(0).$$

$$= s\left\{ \frac{e^{-as}}{s} \right\} - (0)$$

$$= \left\{ e^{-as} \right\}$$

$$\mathcal{L}\left\{ \frac{d}{dt}\left(u(t-a)\right) \right\} = \mathcal{L}\left\{ \text{Dirac}(t-a) \right\}$$

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

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

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

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

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

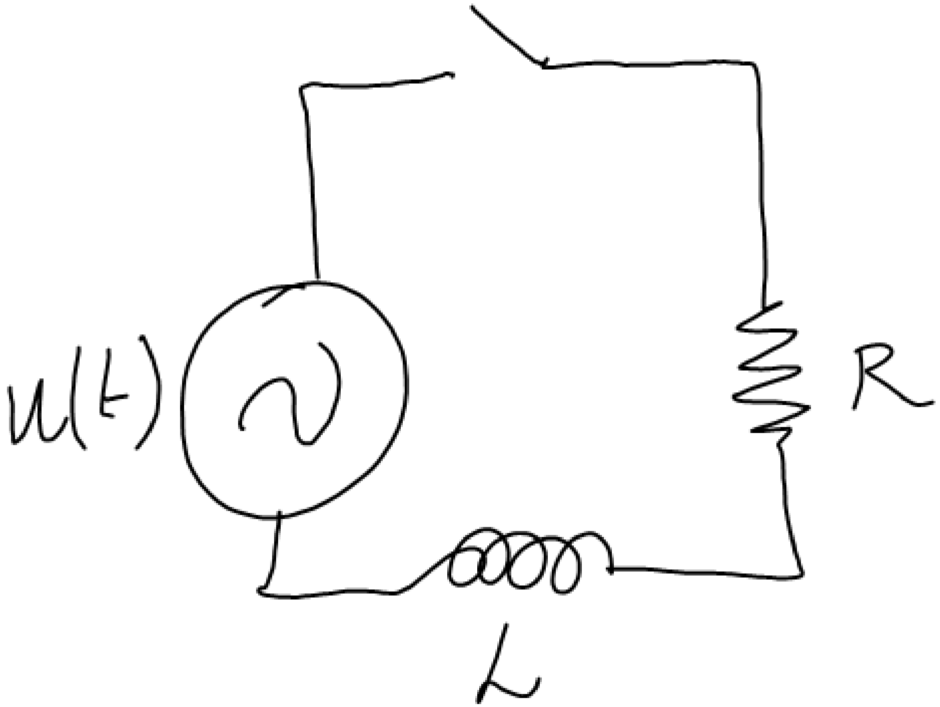
$$e^{-t}\cos(t) - e^{-t}\cdot \operatorname{sen}(t)$$

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

$$P(D)y \longrightarrow y = c_1 e^{a_1 t} + c_2 e^{a_2 t} + \dots + c_n e^{a_n t}$$

$$y = c_1 e^{a_1 t} + c_2 t e^{a_1 t} + c_3 t^2 e^{a_1 t}$$

$$y = c_1 e^{at}\cos(bt) + c_2 e^{at}\operatorname{sen}(bt)$$



$$L\frac{di}{dt} + Ri = 117\cos(60t)\cdot u(t-a).$$

$$+\frac{1}{C}\int i\,dt$$