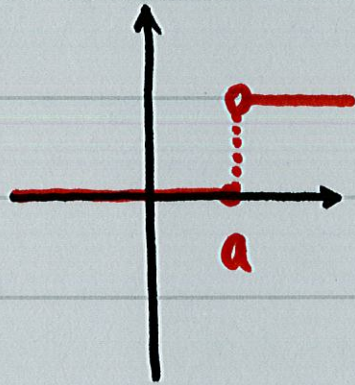


### §6.3 Unit Step Function. 2<sup>nd</sup> Shifting Thrm (t-shifting).

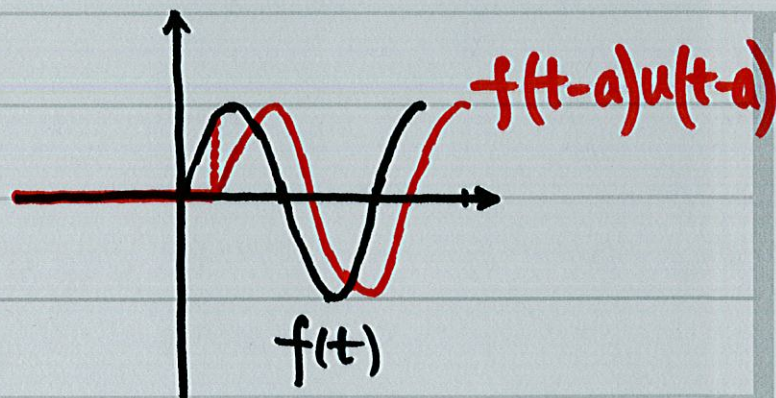
- unit step function

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



- $\mathcal{L}\{u(t-a)\} = \frac{e^{-as}}{s} \quad (s > 0)$

$$f(t-a)u(t-a) = \begin{cases} 0 & t < a \\ f(t-a) & t > a \end{cases}$$



shifting  $f$  to the right by  $a$

$$\bullet \mathcal{L}\{f(t-a)u(t-a)\} = e^{-as} \mathcal{L}\{f(t)\}$$

Ex. 1

$$f(t) = \begin{cases} 2 & 0 < t < 1 \\ \frac{1}{2}t^2 & 1 < t < \frac{\pi}{2} \\ \cos t & t > \frac{\pi}{2} \end{cases}$$

$$\mathcal{L}\{f\} =$$

Ex. 2

$$\mathcal{L}^{-1}\left\{\frac{e^{-s}}{s^2+\pi^2} + \frac{e^{-2s}}{s^2+\pi^2} + \frac{e^{-3s}}{(s+2)^2}\right\}$$