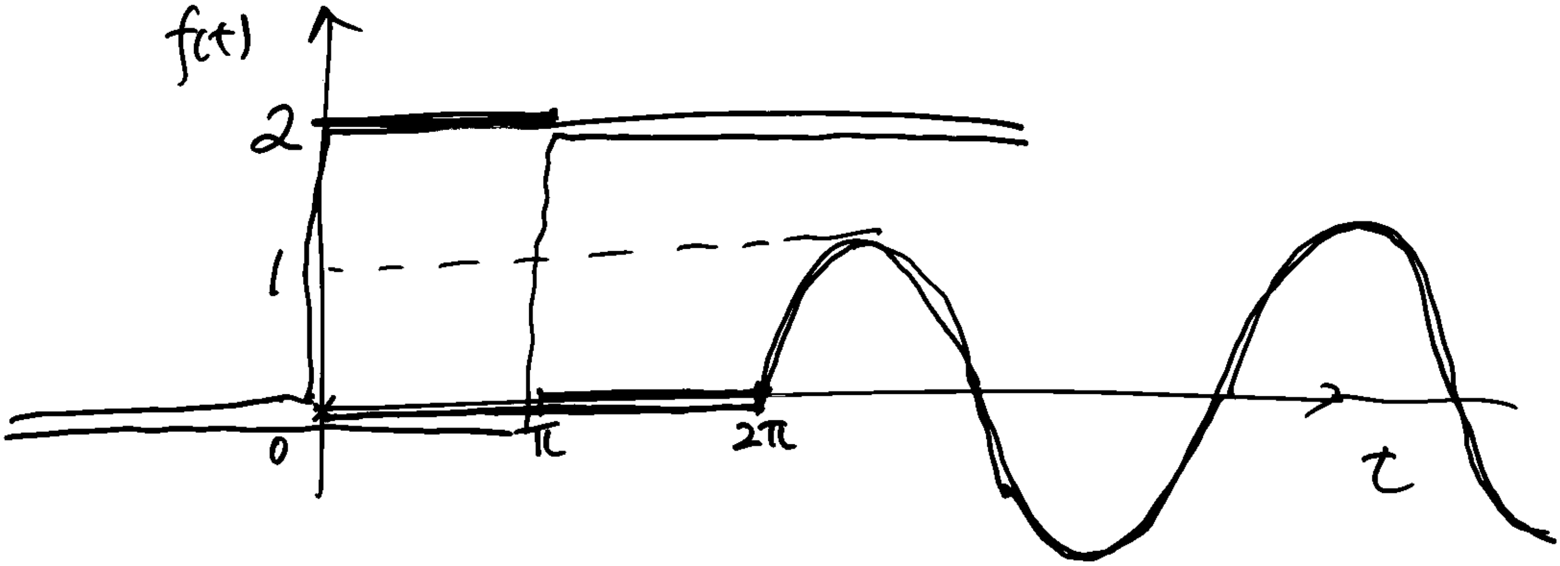
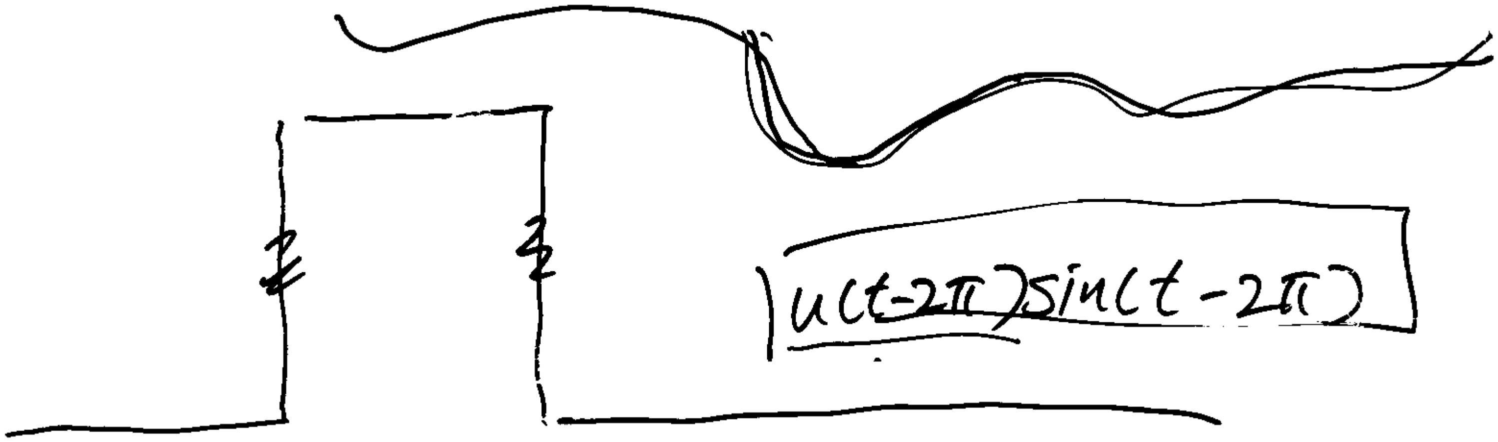
$f(t)$	$F(s)$
$f(t)=1,\ t\geq 0$	$\frac{1}{s}$
$e^{at},\ t\geq 0$	$\frac{1}{s-a}$

$$\mathcal{L}[af(t)+bg(t)] = aF(s)+bG(s)$$

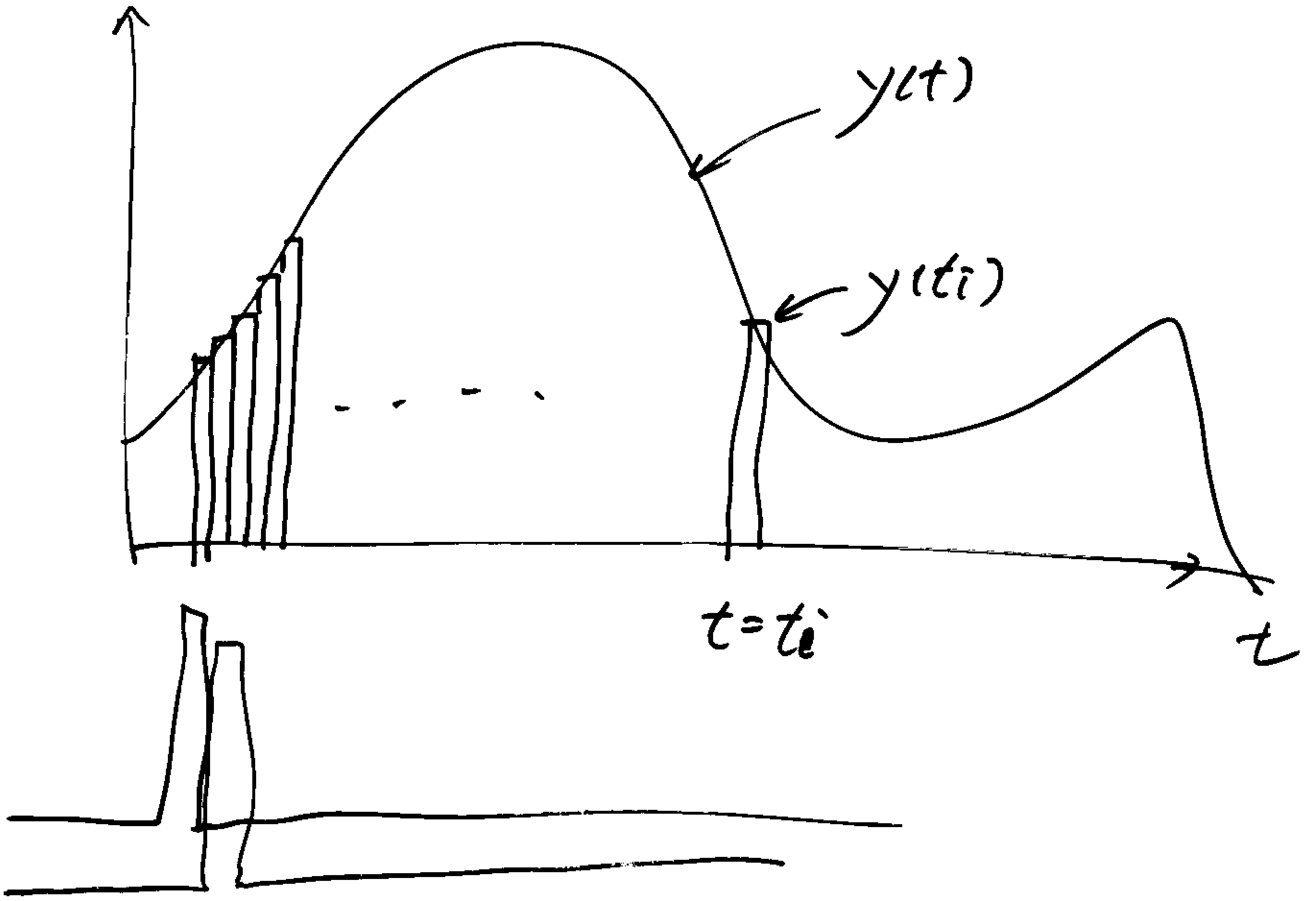
$\cos\omega t$	$\frac{s}{s^2+\omega^2}$
$\sin\omega t$	$\frac{\omega}{s^2+\omega^2}$
t^{n+1}	$\frac{(n+1)!}{s^{n+2}}$
$t^a,\ a>0$	$\frac{\Gamma(a+1)}{s^{a+1}}$
$e^{at}f(t)$	$F(s-a)$
$\int_0^t f(\tau)d\tau$	$\frac{1}{s}F(s)$

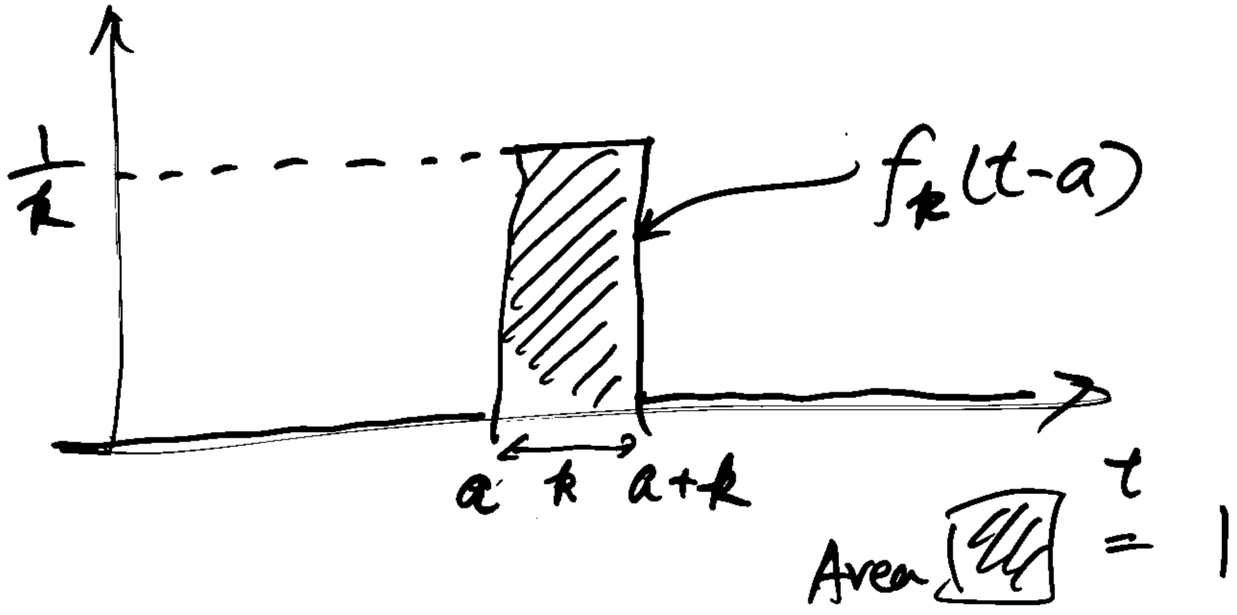




$\boxed{u(t-2\pi)\sin(t-2\pi)}$

$2[u(t)-u(t-\pi)]$





$= 1$

$$\frac{1}{s^2-1} = \frac{1}{(s+1)(s-1)}$$

$$= \frac{A}{s+1} + \frac{B}{s-1}$$

$$\frac{1}{(s+1)(s-1)} = \frac{A}{(s+1)} + \frac{B}{(s-1)}$$

$* \; (s+1)(s-1)$

$$1 = A(s-1) + B(s+1)$$

$s = -1$

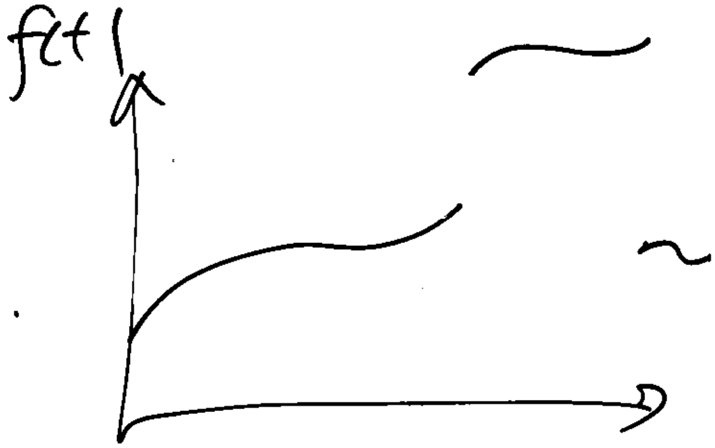
$$1 = A\cdot(-1-1) \Rightarrow A = \frac{-1}{2}$$

$* \; s = 1 \Rightarrow 1 = B\cdot(1+1) \Rightarrow B = \frac{1}{2}$

$$\frac{1}{(s+1)(s-1)} = \left[\frac{-1}{(s+1)} + \frac{1}{s-1}\right]\cdot\frac{1}{2}$$

$$
\begin{tikzcd}[column sep=huge, row sep=huge]
t\text{-domain} & S\text{-domain} \\
f(t) \arrow[r, "\mathcal{L}[\ ]"] \arrow[d, "\text{Complicated operations on } f(t)"] & F(s) \arrow[d, "\text{simple operations on } F(s)"] \\
\text{Results in } t\text{-domain } g(t) & \text{result } G(s) \arrow[l, "\mathcal{L}^{-1}[\ ]"]
\end{tikzcd}
$$

$\mathcal{L}[g(t)]$



$g(t) = \int_0^t f(\tau)\,d\tau.$

$\Rightarrow g'(t) = f(t)$

$\mathcal{L}[g'(t)] = sG(s) - \cancel{g(0)}$

$g(0) = \int_0^0 f(\tau)\,d\tau = 0$

$g'(t) = f(t)$

$\mathcal{L}[g'(t)] = \mathcal{L}[f(t)] = F(s)$

$F(s) = sG(s)$

$\frac{F(s)}{s} = \mathcal{L}[g(t)]$