Definition of Laplace Transform: $\mathcal{L}\{f(t)\} = \int_0^\infty e^{-st} f(t)dt = F(s)$

1st shifting theorem(L.T.): if $\mathcal{L}\{f(t)\} = F(s), then\ \mathcal{L}\{e^{at} f(t)\} = F(s-a)$
1st shifting theorem(I.L.T.): if $\mathcal{L}^{-1}\{F(s)\} = f(t), then\ \mathcal{L}^{-1}\{F(s-a)\} = e^{at} f(t)$

	Laplace Transform Formulae	Inverse Laplace Transform Formulae	1st Shifting Laplace Transform Formulae	1st Shifting Inverse Laplace Transform Formulae
1	$\mathcal{L}\{K\} = \frac{K}{s}$	$\mathcal{L}^{-1}\left\{\frac{K}{s}\right\} = K$	$\mathcal{L}\{e^{at}K\} = \frac{K}{(s-a)}$	$\mathcal{L}^{-1}\left\{\frac{K}{(s-a)}\right\} = e^{at}K$
2	$\mathcal{L}\{e^{kt}\} = \frac{1}{s-k}$	$\mathcal{L}^{-1}\left\{\frac{1}{s-k}\right\} = e^{kt}$	$\mathcal{L}\{e^{at}e^{kt}\} = \frac{1}{(s-a)-k}$	$\mathcal{L}^{-1}\left\{\frac{1}{(s-a)-k}\right\} = e^{at}e^{kt}$
3	$\mathcal{L}\{\sin kt\} = \frac{k}{s^2+k^2}$	$\mathcal{L}^{-1}\left\{\frac{k}{s^2+k^2}\right\} = \sin kt$	$\mathcal{L}\{e^{at}\sin kt\} = \frac{k}{(s-a)^2+k^2}$	$\mathcal{L}^{-1}\left\{\frac{k}{(s-a)^2+k^2}\right\} = e^{at}\sin kt$
4	$\mathcal{L}\{\cos kt\} = \frac{s}{s^2+k^2}$	$\mathcal{L}^{-1}\left\{\frac{s}{s^2+k^2}\right\} = \cos kt$	$\mathcal{L}\{e^{at}\cos kt\} = \frac{s-a}{(s-a)^2+k^2}$	$\mathcal{L}^{-1}\left\{\frac{s-a}{(s-a)^2+k^2}\right\} = e^{at}\cos kt$
5	$\mathcal{L}\{\sinh kt\} = \frac{k}{s^2-k^2}$	$\mathcal{L}^{-1}\left\{\frac{k}{s^2-k^2}\right\} = \sinh kt$	$\mathcal{L}\{e^{at}\sinh kt\} = \frac{k}{(s-a)^2-k^2}$	$\mathcal{L}^{-1}\left\{\frac{k}{(s-a)^2-k^2}\right\} = e^{at}\sinh kt$
6	$\mathcal{L}\{\cosh kt\} = \frac{s}{s^2-k^2}$	$\mathcal{L}^{-1}\left\{\frac{s}{s^2-k^2}\right\} = \cosh kt$	$\mathcal{L}\{e^{at}\cosh kt\} = \frac{s-a}{(s-a)^2-k^2}$	$\mathcal{L}^{-1}\left\{\frac{s-a}{(s-a)^2-k^2}\right\} = e^{at}\cosh kt$
7	$\mathcal{L}\{t^n\} = \begin{cases} \frac{\Gamma(n+1)}{s^{n+1}} & ; n\ is\ non\ integer \\ \frac{n!}{s^{n+1}} & ; n\ is\ integer \end{cases}$	$\left. \begin{matrix} \mathcal{L}^{-1}\left\{\frac{\Gamma(n+1)}{s^{n+1}}\right\}; n\ is\ non\ integer \\ \mathcal{L}^{-1}\left\{\frac{n!}{s^{n+1}}\right\}; n\ is\ integer \end{matrix} \right\} = t^n$	$\mathcal{L}\{e^{at}t^n\} = \begin{cases} \frac{\Gamma(n+1)}{(s-a)^{n+1}} & ; n\ is\ non\ integer \\ \frac{n!}{(s-a)^{n+1}} & ; n\ is\ integer \end{cases}$	$\left. \begin{matrix} \mathcal{L}^{-1}\left\{\frac{\Gamma(n+1)}{(s-a)^{n+1}}\right\}; n\ is\ non\ integer \\ \mathcal{L}^{-1}\left\{\frac{n!}{(s-a)^{n+1}}\right\}; n\ is\ integer \end{matrix} \right\} = e^{at}t^n$

Theorems: $\mathcal{L}\{f(t)\} = F(s) \Rightarrow \mathcal{L}\{f(bt)\} = \frac{1}{b} F\left(\frac{s}{b}\right)$
Theorems: $\mathcal{L}^{-1}\{F(s)\} = f(t) \Rightarrow \mathcal{L}^{-1}\{F(ks)\} = \frac{1}{k} f\left(\frac{t}{k}\right)$