Information:
We will use the time-shift property, convolution property and differentiation (in $s$-domain) property of Laplace transform.

- If $\mathcal{L}\{y(t)\} = Y(s)$ with ROC $R$, the Laplace transform of the time-shifted signal is given by $\mathcal{L}\{y(t - t_0)\} = e^{-st_0}Y(s)$, ROC : $R$.

- If $\mathcal{L}\{y(t)\} = Y(s)$ with ROC $R$, the differentiation in $s$-domain implies $\mathcal{L}\{-ty(t)\} = \frac{dY(s)}{ds}$, ROC : $R$.

- If $\mathcal{L}\{y_1(t)\} = Y_1(s)$ with ROC $R_1$ and $\mathcal{L}\{y_2(t)\} = Y_2(s)$ with ROC $R_2$, the Laplace transform of the convolution of $y_1(t)$ and $y_2(t)$ is given by $\mathcal{L}\{y_1(t) \ast y_2(t)\} = Y_1(s)Y_2(s)$, ROC : At least $R_1 \cap R_2$.

Tutorial 11-1
Determine the time-domain function $x(t)$ for each of the following Laplace transforms and their associated regions of convergence:

(a) $\frac{s}{s^2 + 9}$, $\Re\{s\} < 0$

(b) $\frac{s+1}{s^2 + 3s + 6}$, $-3 < \Re\{s\} < -2$

Tutorial 11-2
Determine the Laplace transform of the following time-domain functions $x(t)$:

(a) $x(t) = te^{2t}u(-t)$

(b) $x(t) = u(t) - u(t - 1)$

Tutorial 11-3
Consider a causal LTI system with impulse response $h(t)$ whose Laplace transform $H(s)$ is given by

$$H(s) = \frac{s - 1}{s + 1}.$$

(a) Determine the possible inputs to this LTI system such that the output of the system is given by $y(t) = e^{-2t}u(t)$.

(b) If the input satisfies $\int_{-\infty}^{\infty} |x(t)|dt < \infty$, which of the inputs determined in previous part produces the output $y(t)$.