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(2) From the previous discussion, if impulse response ($y_\delta$) of the system is given, for any input forcing function $f(t)$, the LT of the response $y$ is

☆ It means, if the impulse response $y_\delta$ is given, we can predict the system response with any input forcing function $f(t)$ by

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Ex: Assume a system modeled by $y'' + 4y = f(t)$ with $y(0) = y'(0) = 0$. What is the system response when the forcing is $f(t) = e^{-t}$ ?

(3) This technique of using impulse response to obtain response of any forcing is very useful.

This technique can be applied when the system is

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## Other useful LT operations

We already know

t-domain

s-domain

$Q_1$: What's the inverse LT for "derivative in s-domain"?

ex: $\mathcal{L}\{t\sin kt\} = ?$

$Q_2$: What's the LT for "integration in t-domain"?

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

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## Summary of some useful operations of LT

| $\tau$-domain | $s$-domain |
| --- | --- |