LECTURE 4   Laplace Transform *(cont).*

Convolution

- Recall definition

   Example: $f(t) = e^{at}$, $g(t) = e^{bt}$

- $f * g = g * f$

- $\mathcal{L}(f * g) = F(s)G(s)$

- Application I: Integral equations:

   Example: $y(t) = 1 + \int_0^t (t - \tau)y(\tau)d\tau$

- Application II: initial value problem from equilibrium position

   Example: Damped oscillations

Differentiation and integration of the Laplace transform

- Differentiation of the LT

- Integration of LT

- Examples

$$\mathcal{L}^{-1}\left(\frac{s}{(\omega^2 + s^2)^2}\right) = \frac{t}{2\omega}\sin\omega t$$

$$\mathcal{L}^{-1}\log\left(1 + \frac{\omega^2}{s^2}\right) = \frac{2}{t}(1 - \cos\omega t)$$

Summary