

SEOUL NATIONAL UNIVERSITY
SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING

SYSTEM CONTROL

Fall 2010

HW#1 Laplace Transform

Out: September 8, 2010 (We)
Due: September 15, 2010 (We)

[1] Compute Laplace Transform

(1) unit step $1(t)$

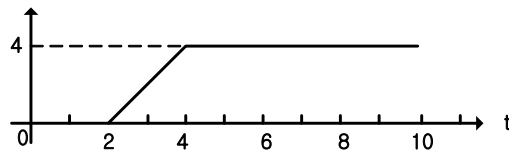
(2) $\sin \omega t$

(3) $\frac{1}{a}(1 - e^{-at})$

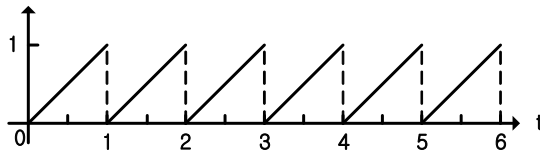
(4) $e^{-at} \cos \omega t$

[2] Find the Laplace transforms of

(1) $f(t)$



(2) $f(t) =$



[3] Obtain the inverse Laplace transform of followings:

(1) $\frac{1}{s+a}$ (2) $\frac{1}{(s+a)^2}$ (3) $\frac{1}{s^2 - \omega^2}$ (4) $F(S) = \frac{1}{(S+2)^2(S+3)}$.

[4] Show that

$$L\left\{\frac{d}{dt}f(t)\right\} = sF(s) - f(0)$$

where $F(s) = L\{f(t)\}$

[5] Show that:

$$\lim_{t \rightarrow 0} f(t) = \lim_{s \rightarrow \infty} sF(s)$$

[6] Solve following differential equation by Laplace transformation.

$$\ddot{y} + 2\dot{y} + 4y = 1$$

$$y(0) = 0, \quad \dot{y}(0) = 2$$