[1] Compute Laplace Transform
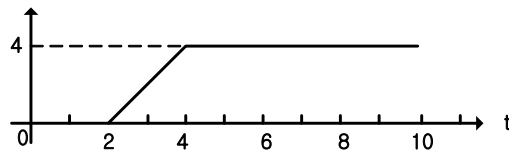
(1) unit step $1(t)$

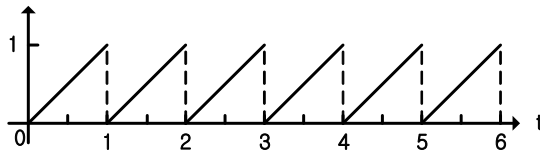(2) $\sin \omega t$

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

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

[4] Show that

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

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

[5] Show that:

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

[6] Solve following differential equation by Laplace transformation.

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

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