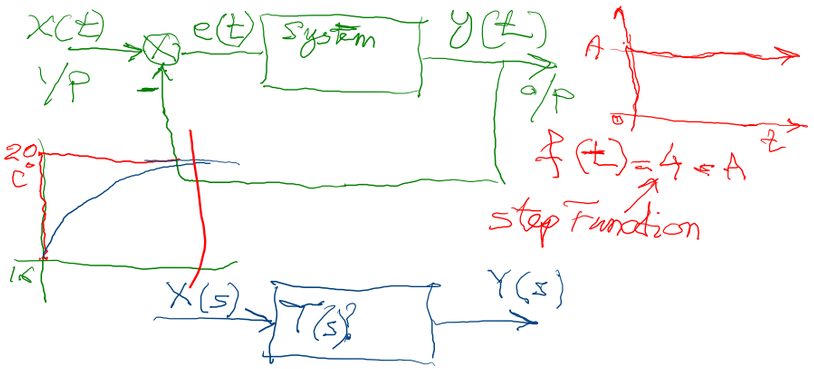


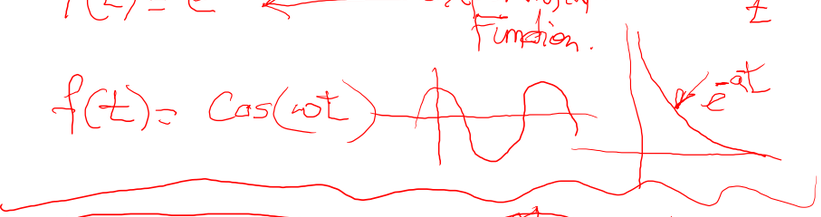
$f(t) = A$ ← Step Function

≈ 1 Unit step Function ①

$f(t) = \delta(t)$ ← Impulse Function ②

$f(t) = t$ ← Ramp Function.

$f(t) = e^{-at}$ ← exponential Function.



$f(t) = \cos(\omega t)$

$$\mathcal{L}[f(t)] = F(s) = \int_0^\infty f(t)\, e^{-st}\, dt$$

Laplace of Unit step Function

$f(t) = 1(t)\,; t \geq 0$

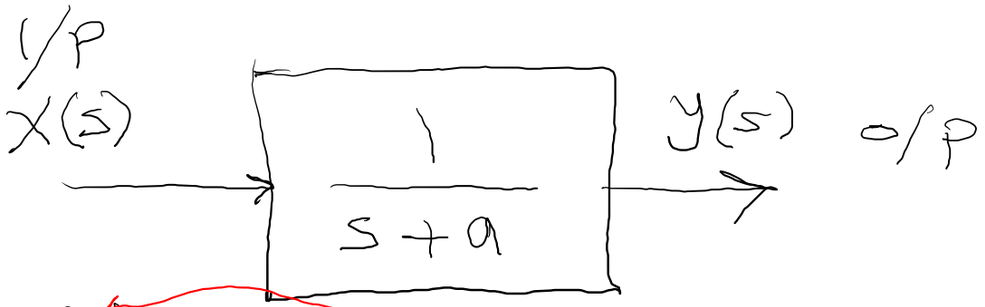
$\frac{de^{-st}}{dt} = -se^{-st}$

$F(s) = \frac{-1}{-s}\int_0^\infty -s e^{-st}\, dt =$

$= \frac{1}{-s}\left[e^{-st}\right]_0^\infty = \frac{-1}{s}\left[e^{-s(\infty)} - e^{-s(0)}\right]$

$e^{-\infty} = \frac{1}{e^\infty} = \frac{1}{\infty} \to 0$

$= \frac{-1}{s}[-1] = \frac{1}{s}$



$$\frac{Y(s)}{X(s)} = \frac{1}{s+a}$$

Transfer Function = Laplace transform of O/P / Laplace transform of I/P

(initial Condition = Zero)

$x(t) = 1$

$X(s) = \frac{1}{s}$

$$Y(s) = \frac{1}{s(s+a)}$$

$$= \frac{1}{s} - \frac{1}{s+a}$$

$$y(t) = 1 - e^{-at}$$