① Find Laplace Transform ?

$$X(s) = \frac{(s+1)^2}{(s^2-s+1)} \qquad Re\{s\} > 1/2$$

$$= 1 + \frac{3s}{s^2-s+1} = 1 + \frac{3s}{(s-1/2)^2 + (\sqrt{3}/2)^2}$$

$$= 1 + \frac{3(s-1/2)^2}{(s-1/2)^2 + (\sqrt{3}/2)^2} + \frac{3/2}{(s-1/2)^2 + (\sqrt{3}/2)^2}$$

Taking inverse Laplace Transform

$$x(t) = \delta(t) + 3e^{-t/2}\cos(\sqrt{3}/2\, t)u(t) + \sqrt{3}\, e^{-t/2}\sin(\sqrt{3}/2\, t)u(t)$$

② Find Laplace Transform. Also plot pole-zero graph of.

$$e2t\, u(-t) + e^{3t}u(-t)$$

$e^{2t}u(-t) + e^{3t}u(-t)$

Since $e^{-at}u(t) \xleftrightarrow{L} \frac{-1}{s+a}$ $\quad Re\{s\} < -a$

$\therefore e^{at}u(-t) \xleftrightarrow{L} \frac{-1}{s-a}$ $\quad Re\{s\} < a$

$e^{2t}u(-t) + e^{3t}u(-t) \xleftrightarrow{L} \frac{-1}{s-2} - \frac{1}{s-3}$

$= -\frac{[2s-5]}{(s-2)(s-3)} = \frac{A}{(s-2)} + \frac{B}{s-3)}$

$A = -\left[\frac{2s-5}{s-3}\right]_{s=2} = -1$

$B = -\left[\frac{2s-5}{s-2}\right]_{s=3} = -1$

$\therefore e^{2t}u(-t) + e^{3t}u(-t) \xleftrightarrow{L} \frac{-1}{s-2} - \frac{1}{s-3}$

ROC is $Re\{s\} < 2$

Pole zero graph