quiz 6 : 9:00AM

(1) $y''' - 6y'' + 11y' - 6y = 0$

$\Rightarrow$ characteristic polynomial

$$r^3 - 6r^2 + 11r - 6 = 0$$

$r = 3$ is one root:

$$(r^3 - 6r^2 + 11r - 6) : (r - 3) = r^2 - 3r + 2$$

$$\begin{array}{l} -r^3 \mp 3r^2 \\ \hline 0 \quad -3r^2 + 11r \\ \quad \mp 3r^2 \pm 9r \\ \hline \quad 0 \quad 2r - 6 \\ \quad\quad -2r \mp 6 \\ \hline \quad\quad\quad 0 \end{array}$$

$\Rightarrow (r^3 - 6r^2 + 11r - 6) = (r-3)(r^2 - 3r + 2)$

roots of $r^2 - 3r + 2 = 0$

$$r = \frac{3}{2} \pm \sqrt{\frac{9}{4} - 2} = \frac{3}{2} \pm \frac{1}{2} = 2, 1$$

$\Rightarrow (r^3 - 6r^2 + 11 - 6) = (r-3)(r-1)(r-2)$

$\Rightarrow$ general sln. to given deq. (1):

$$\underline{\underline{y(t) = c_1 e^{3t} + c_2 e^{2t} + c_3 e^{t}, \quad c_1, c_2, c_3 \in \mathbb{R}.}}$$

2.)

$$\frac{1}{(s-1)^2} + \frac{s-1}{s^2-2s+5} = \mathcal{L}(\,?\,)$$

•) $\frac{1}{(s-1)^2} = \frac{d}{ds}\Big(\underbrace{\frac{1}{(s-1)}\cdot(-1)}_{\mathcal{L}(-e^t)}\Big) = \mathcal{L}(\;te^t)$

•) $\frac{s-1}{s^2-2s+5} = \frac{(s-1)}{(s-1)^2+4} = \mathcal{L}(\cos(2t)e^t)$

$\Rightarrow \frac{1}{(s-1)^2} + \frac{s-1}{s^2-2s+5} = \underline{\underline{\mathcal{L}(te^t + \cos(2t)e^t)}}$.