Universidad de San Carlos de Guatemala
Facultad de Ingeniería
Departamento de Matemática
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Curso: Matemática Aplicada 1
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TAREA No. 1

PONDERACIÓN	
Presentación	/10
Tarea completa	/50
Ejercicios calificados	/40
TOTAL	/100

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Guatemala, 2___/05__/2025___

Unidad 7

Sección 7.1

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$\boxed{\#1}$

Ej 2

$$f(t) = \begin{cases} 4 & 0 \le t < 2 \\ 0 & t \ge 2 \end{cases}$$

$$\mathcal{L}\{f(t)\} = \int_0^2 e^{-st}(4)\,dt + \cancel{\int_2^\infty e^{-st}(0)\,dt}$$

$$= \int_0^2 4e^{-st}\,dt \to \left[-\frac{4e^{-st}}{s}\right]_0^2 \to \boxed{\frac{-4e^{-2s}}{s} + \frac{4}{s}}$$

5

$\boxed{\#2}$

Ej 5

$$f(t) = \begin{cases} \sin t, & 0 \le t < \pi \\ 0, & t \ge \pi \end{cases}$$

$$\mathcal{L}\{f(t)\} = \int_0^\pi e^{-st}\sin t\,dt + \cancel{\int_\pi^\infty e^{-st}\,0}$$

$u = \sin t$ $\quad dv = e^{-st}$

$du = \cos t\,dt$ $\quad v = -\frac{e^{-st}}{s}$

e^{-st}	$\sin t$
$-se^{-st}$	$+$ $\cos t$
$s^2 e^{-st}$	$-$ $\sin t$

$$\int u\,dv = uv - \int v\,du$$

$$\int \sin t\, e^{-st} = -\frac{\sin t\, e^{-st}}{s} - \int -\frac{e^{-st}}{s}\cos t\,dt$$

$$= -\frac{\sin t\, e^{-st}}{s} + \int \frac{e^{-st}}{s}\cos t\,dt \Rightarrow$$

$u = \cos t$ $\quad dv = \frac{e^{-st}}{s}$

$du = -\sin t\,dt$ $\quad v = -\frac{e^{-st}}{s^2}$

$$\int \cos t\,\frac{e^{-st}}{s} = \cos t\left(-\frac{e^{-st}}{s^2}\right) - \int -\frac{e^{-st}}{s^2}(-\sin t\,dt)$$

$$\int e^{-st}\sin t\,dt = -\frac{1}{s}e^{-st}\sin t - \frac{1}{s^2}e^{-st}\cos t - \int \frac{1}{s^2}e^{-st}\sin t\,dt$$

$$\int e^{-st}\sin t\,dt = -\frac{1}{s}e^{-st}\sin t - \frac{1}{s^2}e^{-st}\cos t - \frac{1}{s^2}\int e^{-st}\sin t\,dt$$

$$\int e^{-st}\sin t\,dt + \frac{1}{s^2}\int e^{-st}\sin t\,dt = -\frac{1}{s}e^{-st}\sin t - \frac{1}{s^2}e^{-st}\cos t$$

$$1+\frac{1}{s^2}\int e^{-st}\sin t\,dt = -\frac{1}{s}e^{-st}\sin t - \frac{1}{s^2}e^{-st}\cos t$$

$$\int e^{-st}\sin t\,dt = -\frac{\frac{e^{-st}\sin t}{s}}{\frac{s^2+1}{s^2}} - \frac{\frac{e^{-st}\cos t}{\cancel{s^2}}}{\frac{s^2+1}{\cancel{s^2}}}$$

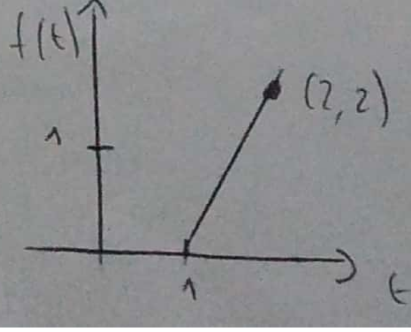
$$\int e^{st}\sin t\,dt \; - \frac{e^{-st}\sin t\, s}{s^2+1} - \frac{e^{-st}\cos t}{s^2+1}$$

$$\left[-\frac{e^{-s\pi}\cancel{\sin\pi\, s}}{s^2+1} - \frac{e^{-s\pi}\cos\pi}{s^2+1}\right] - \left[\cancel{\frac{-e^{-s0}\sin 0\, s}{s^2+1}} - \frac{e^{-s0}\cos 0}{s^2+1}\right]$$

$$+\frac{e^{-s\pi}}{s^2+1} + \frac{1}{s^2+1} \Rightarrow \boxed{\frac{e^{-s\pi}+1}{s^2+1}}$$

8

#3



$$f(t) = \begin{cases} 0 & 1 \le t < 1 \\ 2t-2 & t > 1 \end{cases}$$

$$\mathcal{L}\{f(t)\} = \int_1^{\infty}(2t-2)e^{-st}\,dt$$

$$\lim_{b\to\infty}\int_1^b (2t-2)\,e^{-st}\,dt$$

$2t-2$	e^{-st}
2	$\frac{e^{-st}}{-s}$
0	$\frac{e^{-st}}{s^2}$

$$(2t-2)\left(-\frac{e^{-st}}{s}\right) - 2\frac{e^{-st}}{s^2}$$

→ al ser infinito y b gana todo es 0

$$F(s) = \left(-2t\frac{e^{-st}}{s} - \frac{2e^{-st}}{s} + \frac{2e^{-st}}{s^2}\right)_1^{\infty}$$

$$F(s) = -\frac{2e^{-s}}{s} + \frac{2e^{-s}}{s} + \frac{2e^{-s}}{s^2} \Rightarrow \boxed{\frac{2e^{-s}}{s^2}}$$

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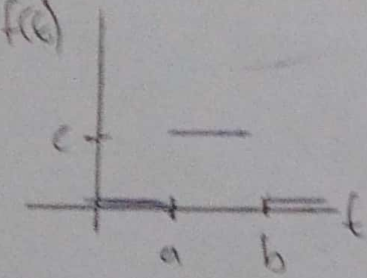
#4



$$f(t) = \begin{cases} 0 & 0 \le t < a \\ c & a \le t < b \\ 0 & t \ge b \end{cases}$$

$$\mathcal{L}\{f(t)\} = \int_0^a e^{-st}\,0\,dt + \int_a^b e^{-st}\cdot c\,dt + \int_b^\infty e^{-st}\cdot 0$$

$$\mathcal{L}\{f(t)\} = \left[-\frac{c e^{-st}}{s}\right]_a^b \rightarrow -\frac{c e^{-bs}}{s} + \frac{c e^{-as}}{s}$$

$$\boxed{\frac{c}{s}\left(-e^{-bs} + e^{-as}\right)}$$

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#5

$$f(t) = te^{4t} \rightarrow \mathcal{L}\{f(t)\} = \int_0^\infty t e^{4t} e^{-st}\,dt \rightarrow \int_0^\infty t\, e^{4t-st}\,dt$$

t	e^{4t-st}
1	$\frac{e^{4t-st}}{4-s}$
0	$\frac{e^{4t-st}}{(4-s)^2}$

$$F(s) = \left[\frac{t\,e^{4t-st}}{4-s} - \frac{e^{4t-st}}{(4-s)^2}\right]_0^\infty$$

$$f(s)=\left[\cancel{\frac{\infty e^{\infty}}{4-s}}-\frac{e^{\infty}}{(4-s)^2}\right]-\left(\frac{0\,e^{0}}{4-s}-\frac{1}{(4-s)^2}\right)$$

$$\boxed{F(s)=+\frac{1}{(4-s)^2}}$$

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#6

$f(t)=t^2e^{-2t}$ $\qquad \mathcal{L}\{f(t)\}=\int_0 t^2 e^{-2t} e^{-st}$

$$\mathcal{L}\{f(t)\}=\int_0^{\infty} t^2 e^{-t(2+s)} , \int_0^{\infty} t^2 e^{-t(2+s)}$$

t^2	$e^{-t(2+s)}$
$2t$	$-\frac{e^{-t(2+s)}}{2+s}$
2	$+\frac{e^{-t(2+s)}}{(2+s)^2}$
0	$-\frac{e^{-t(2+s)}}{(2+s)^3}$

$$f(s)=\left[-\frac{t^2e^{-2t-st}}{(2+s)}-\frac{2t\,e^{-2t-st}}{(2+s)^2}-\frac{2e^{-2t-st}}{(2+s)^3}\right]_0^{\infty}$$

$$f(s)=-\left[-\frac{2}{(2+s)^3}\right]\rightarrow \boxed{F(s)=\frac{2}{(2+s)^3}}$$

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#7

$f(t)=e^{-t}\sin t \rightarrow \mathcal{L}(f(t))=\int_0^{\infty}\sin t\, e^{-t}e^{-st}dt$

$$\int_0^{\infty}\sin t\, e^{-t-st}\rightarrow\int_0^{\infty}\sin t\, e^{-t(1+s)}dt$$

$u=\sin t \qquad dv=e^{-t(1+s)}$

$du=\cos t \qquad v=-\frac{e^{-t(1+s)}}{(1+s)}$

$$\int \sin t\, e^{-t(1+s)}=-\frac{e^{-t(1+s)}}{(1+s)}(\sin t)-\int-\frac{e^{-t(1+s)}}{(1+s)}(\cos t)\,dt$$

$$= -\frac{\sin t\, e^{-t(1+s)}}{(1+s)} + \frac{1}{(1+s)}\int e^{-t(1+s)} \cos t\, dt$$

$u = \cos t \qquad dv = e^{-t(1+s)}$

$du = -\sin t \qquad v = -\frac{e^{-t(1+s)}}{(1+s)}$

$$\int \sin e^{-t(1+s)} = -\frac{\sin t\, e^{-t(1+s)}}{(1+s)} + \frac{1}{(1+s)}\left[\cos t\left(-\frac{e^{-t(1+s)}}{(1+s)}\right) - \int -\frac{e^{-t(1+s)}}{1+s}(-\sin$$

$$-\frac{1 \cdot \cos t\,(e^{-t(1+s)})}{(1+s)^2} - \frac{1}{(1+s)^2}\int e^{-t(1+s)}(\sin(t))$$

$$1\int \sin t\, e^{-t(1+s)} + \frac{1}{(1+s)^2}\int e^{-t(1+s)}(\sin(t)) = -\frac{\sin e^{-t(1+s)}}{(1+s)} - \frac{\cos t\,(e^{\cdot}}{(1+s)^2}$$

$$\left(\frac{(1+s)^2+1}{(1+s)^2}\right)\int \sin t\, e^{-t(1+s)} = -\frac{\sin t\, e^{-t(1+s)}}{(1+s)} - \frac{\cos t\,(e^{-t(1+s)}}{(1+s)^2}$$

$$\int \sin t\, e^{-t(1+s)} = \frac{\frac{-e^{-t(1+s)}}{(1+s)}}{\frac{(1+s)^2+1}{(1+s)^2}}\left(\sin t + \frac{\cos t}{(1+s)}\right)$$

$$= \frac{(1+s)^2\,(-e^{-t(1+s)}}{\cancel{(1+s)}\,((1+s)^2+1)}\left(\sin t + \frac{\cos t}{(1+s)}\right) \to$$

6)

$$-\left[\frac{\cancel{(1+s)}\,(1-e^{-0}}{((1+s)^2+1)}\left(0+\frac{1}{(1+s)}\right)\right]$$

$$\boxed{F(s)=\frac{1}{s^2+2s+2}}$$

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#19

$f(t)=t\sin t \Rightarrow \mathcal{L}\{f(t)\}=\int_0^\infty t\sin t\, e^{-st}$

$u=t \qquad dv=\sin t\, e^{-st}$

$du=1\,dt$

$v=\frac{-e^{-st}\sin t\, s}{s^2+1}-\frac{e^{-st}\cos t}{s^2+1}$

$\int \sin t\, e^{-st}$

$u=\sin t \qquad dv=e^{-st}$

$du=\cos t \qquad v=-\frac{e^{-st}}{s}$

$\int \sin t\, e^{-st}=\sin t\left(-\frac{e^{-st}}{s}\right)-\int -\frac{e^{-st}}{s}\cos t$

$\int \sin t\, e^{-st}=-\frac{\sin t\, e^{-st}}{s}+\int \frac{e^{-st}}{s}\cos t\,dt$

$u=\cos t \qquad dv=\frac{e^{-st}}{s}$

$du=-\sin t \qquad v=-\frac{e^{-st}}{s^2}$

$\int \sin t\, e^{-st}=-\frac{\sin t\, e^{-st}}{s}+(-\cos t)\left(\frac{e^{-st}}{s^2}\right)-\int -\frac{e^{-st}}{s^2}(-\sin t)$

$\int \sin t\, e^{-st}=-\frac{\sin t\, e^{-st}}{s}-\frac{\cos t\, e^{-st}}{s^2}-\frac{1}{s^2}\int e^{-st}\sin t$

$\int \sin t\, e^{-st}+\frac{1}{s^2}\int e^{-st}\sin t=-\frac{\sin t\, e^{-st}}{s}-\frac{\cos t\, e^{-st}}{s^2}$

$\left(\frac{s^2+1}{s^2}\right)\int \sin t\, e^{-st} \rightsquigarrow \int \sin t\, e^{-st}=\dfrac{-\frac{\sin t\, e^{-st}}{s}-\frac{\cos t\, e^{-st}}{s^2}}{\left(\frac{s^2+1}{s^2}\right)}$

$\int \sin t\, e^{-st}=\frac{-e^{-st}\sin t\, s}{s^2+1}-\frac{e^{-st}\cos t}{s^2+1}$

$\int t \sin t \, e^{-st} = t\left(\frac{-e^{-st}\sin t\, s}{s^2+1} - \frac{e^{-st}\cos t}{s^2+1}\right) - \int\left(-\frac{e^{-st}\sin t\, s}{s^2+1} - \frac{e^{-st}\cos t}{s^2+1}\right)$

$\mathcal{L}\{\sin t\} = \frac{1}{s^2+1^2}$ $\quad \cancel{\boxed{\mathcal{L}\{t\, f(t)\} = -f'(s)}}$

$f(s) = \frac{1}{s^2+1} \rightarrow -\frac{(2s+0)(1)+(s^2+1)(0)}{(s^2+1)^2} \rightarrow -\frac{2s}{(s^2+1)^2}$

$$\boxed{f(s) = \frac{2s}{(s^2+1)^2}}$$

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#19

$f(t) = 2t^4 \rightarrow \mathcal{L}\{t^n\} = \frac{n!}{s^{n+1}} \rightarrow \frac{4!}{s^5} \rightarrow \frac{24}{s^5}$

$$\boxed{f(s) = \frac{48}{s^5}}$$

23

#10

$f(t) = t^2 + 6t - 3 \rightarrow \frac{2!}{s^3} + \frac{6}{s^2} - \frac{3}{s} \rightarrow \boxed{\frac{2}{s^3} + \frac{6}{s^2} - \frac{3}{s}}$

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$f(t) = (2t-1)^3 \Rightarrow (2t-1)^2(2t-1) \rightarrow (4t^2-4t+1)(2t-1)$

$8t^3 - 8t^2 + 2t - 4t^2 + 4t - 1 \rightarrow 8t^3 - 12t^2 + 6t - 1$

$8\left(\frac{3!}{s^4}\right) - 12\left(\frac{2!}{s^3}\right) + 6\left(\frac{1}{s^2}\right) - \frac{1}{s}$ $\boxed{f(s) = \frac{48}{s^4} - \frac{24}{s^3} + \frac{6}{s^2} - \frac{1}{s}}$

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#11

$f(t) = (1 + e^{2t})^2 \Rightarrow 1 + 2e^{2t} + e^{4t}$

$\frac{1}{s} + 2\left(\frac{1}{s-2}\right) + e\left(\frac{1}{s-4}\right) \rightarrow \boxed{f(s) = \frac{1}{s} + \frac{2}{s-2} + \frac{1}{s-4}}$

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#12

$f(t) = \cos 5t + \sin 2t$

$\frac{s}{s^2+5^2} + \frac{2}{s^2+4^2} \rightarrow \boxed{f(s) = \frac{s}{s^2+25} + \frac{2}{s^2+4^2}}$

37

#14

$f(t) = \sin 2t \cos 2t \rightarrow \frac{1}{2}\sin 2(2t) \rightarrow \frac{1}{2}\sin 4t$

$\frac{1}{2}\left(\frac{4}{s^2+4^2}\right) \quad \boxed{f(s) = \frac{2}{s^2+16}}$

section 7.2

3

#15

$\mathcal{L}^{-1}\left\{\frac{1}{s^2} - \frac{48}{s^5}\right\} \rightarrow \mathcal{L}^{-1}\left\{\frac{1}{s^2}\right\} - \mathcal{L}^{-1}\left\{\frac{48}{s^5}\right\}$

$f(t) = \mathcal{L}^{-1}\left\{\frac{1!}{s^{1+1}}\right\} - 2\,\mathcal{L}^{-1}\left\{\frac{4!}{s^5}\right\}$

$\boxed{f(t) = t - 2t^4}$

6

#16

$\mathcal{L}^{-1}\left\{\frac{(s+2)^2}{s^3}\right\} \rightarrow \mathcal{L}^{-1}\left\{(s+2)^2\right\} \cdot \mathcal{L}^{-1}\left(\frac{1}{s^3}\right) \rightarrow \frac{s^2+4s+4}{s^3}$

$\mathcal{L}^{-1}\left\{\frac{1}{s} + \frac{4}{s^2} + \frac{4}{s^3}\right\} \Rightarrow \mathcal{L}^{-1} \quad \boxed{f(t) = 1 + 4t + 2t^2}$

9

7

#17

$\mathcal{L}^{-1}\left\{\frac{1}{s^2}-\frac{1}{s}+\frac{1}{s-2}\right\} \Rightarrow f(t)=t-1+\mathcal{L}\left\{\frac{1}{s-2}\right\}$

$\boxed{f(t)=t-1+e^{2t}}$

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#19

$\mathcal{L}^{-1}\left\{\frac{4s}{4s^2+1}\right\} \to 4\left\{\frac{4s}{(2s)^2+1^2}\right\} \to \left\{\frac{s}{s^2+\frac{1}{4}}\right\}$

$\boxed{f(t)=\cos\left(\frac{1}{2}\right)t}$

19

#20

$\mathcal{L}^{-1}\left\{\frac{s}{s^2+2s-3}\right\} \to \frac{s}{(s+3)(s-1)}=\frac{A}{s+3}+\frac{B}{s-1}$

$s=A(s-1)+B(s+3) \to s=As-A+Bs+3B$

$1=A+B \to B=1-A$

$0=-A+3B \qquad 0=-A+3(1-A)$

$0=-A+3-3A$

$A=3/4$

$B=1/4$

$\frac{s}{(s+3)(s-1)}=\frac{3/4}{s+3}+\frac{1/4}{s-1}$

$\frac{s}{(s+3)(s-1)}=\frac{3}{4}\left(\frac{1}{s+3}\right)+\frac{1}{4}\left(\frac{1}{s-1}\right)$

$\boxed{f(t)=\frac{3}{4}e^{-3t}+\frac{1}{4}e^{t}}$

23

#22

$\mathcal{L}^{-1}\left\{\frac{s}{(s-2)(s-3)(s-6)}\right\} \Rightarrow \frac{A}{(s-2)}+\frac{B}{s-3}+\frac{C}{s-6}$

$s=A(s-3)(s-6)+B(s-2)(s-6)+C(s-2)(s-3) \qquad 3=B(-3)$

$6=C(4)(3) \to C=\frac{1}{2} \qquad 2=A(-1)(-4) \to A=\frac{1}{2} \qquad B=-1$

9

$$\frac{5}{(s-2)(s-3)(s-6)} = \frac{1/2}{(s-2)} - \frac{1}{s-3} + \frac{1/2}{(s-6)}$$

$$= \frac{1}{2}e^{2t} - e^{3t} + \frac{1}{2}e^{6t} \Rightarrow \boxed{f(s) = \frac{e^{2t}}{2} - e^{3t} + \frac{e^{6t}}{2}}$$

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$$\mathcal{L}^{-1}\left\{\frac{2s-4}{(s^2+s)(s^2+1)}\right\} \Rightarrow \frac{2s-4}{s(s+1)(s^2+1)} \Rightarrow \frac{A}{s} + \frac{B}{s+1} + \frac{Cs+D}{s^2+1}$$ $\boxed{\#24}$

$2s-4 = A(s^2+1)(s+1) + Bs(s^2+1) + Cs(s)(s+1) + D(s)(s+1)$

$2s-4 = A(s^3+s^2+s+1) + Bs^3 + Bs + Cs^3 + Cs^2 + Ds^2 + Ds$

$2 = A + B + D$ $\quad$ $0 = A + B + C$ $\quad$ $0 = -4 + C + 3$

$-4 = A$ $\quad$ $0 = A + C + D$ $\quad$ $C = 1$

$2 + 4 - D = B$ $\quad$ $0 = -4 + 2 + 4 - D + C$ $\quad$ $B = 3$

$4 - 6 + D = C$

$0 = \cancel{-4+4} - 6 + D + D$

$D = 3$

$$= -4\left(\frac{1}{s}\right) + 3\left(\frac{1}{s+1}\right) + \frac{s}{s^2+1} + \frac{3}{s^2+1}$$

$$\boxed{f(s) = -4 + 3e^{-t} + \cos t + 3\sin t}$$

37

$y' + 6y = e^{4t}, \; y(0) = 2$ $\quad$ $\boxed{\#26}$

$\mathcal{L}\{y'\} + 6\mathcal{L}\{y\} = \mathcal{L}\{e^{4t}\}$

$sY(s) - y(0) + 6(Y(s)) = \frac{1}{s-4}$

$\Rightarrow Y(s)[s+6] - 2 = \frac{1}{s+(-4)}$

$$Y(s) = \left[\frac{\frac{1}{s-4} + 2}{s+6}\right]$$

$$Y(s) = \frac{2s-8+1}{s+6} \rightarrow Y(s) = \frac{7s-7}{(s+6)(s-4)}$$

$$2s-7 = A(s-4) + B(s+6)$$

$$2(4)-7 = B(10)$$

$$\frac{1}{10} = B \qquad 2(-6)-7 = A(-6-4)$$

$$-19 = A(-10) \rightarrow A = \frac{19}{10}$$

$$= \frac{\frac{19}{10}}{s+6} + \frac{\frac{1}{10}}{s-4} \Rightarrow \boxed{f(s) = \frac{19}{10}e^{-6t} + \frac{1}{10}e^{4t}}$$

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#29

$$y'' + 5y' + 4y = 0 \qquad y(0) = 1 \qquad y'(0) = 0$$

$$\mathcal{L}^{-1}\{y''\} + 5\mathcal{L}^{-1}\{y'\} + 4\mathcal{L}^{-1}\{y\} = 0$$

$$s^2(Y_s) - sy(0) - y'(0) + 5sY(s) - 5f(0) + 4Y_s = 0$$

$$Y_s[s^2+5s+4] - s+5 = 0 \rightarrow Y_s = \frac{s+5}{s^2+5s+4}$$

$$Y_s = \frac{s+5}{(s+4)(s+1)} \rightarrow \frac{A}{s+4} + \frac{B}{s+1} \rightarrow s+5 = A(s+1) + B(s+4)$$

$$-1+5 = B(3) \rightarrow B = \frac{4}{3}$$

$$-4+5 = A(-3) \rightarrow A = -\frac{1}{3}$$

$$= -\frac{1}{3}\left(\frac{1}{s+4}\right) + \frac{4}{3}\left(\frac{1}{s+1}\right)$$

$$\cancel{Y(s)} \quad f \quad \boxed{y(t) = -\frac{1}{3}e^{-4t} + \frac{4}{3}e^{-t}}$$

#30

$2y''' + 3y'' - 3y' - 2y = e^{-t}$ $y(0)=0$ $y'(0)=0$

$y''(0)=1$

$2s^3Y(s) - 2s^2y(0) - 2sy'(0) - 2y''(0)$

$+3s^2Y(s) - 3sy(0) - 3y'(0)$

$-3sY_s + 3y(0) - 2Y(s) = \frac{1}{s+1}$

$2s^3Y(s) - 2 + 3s^2Y(s) - 3sY(s) - 2Y(s) = \frac{1}{s+1}$

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

$Y(s) = \dfrac{\frac{1}{s+1}+2}{2s^3+3s^2-3s-2} \rightarrow \dfrac{\frac{1}{s+1}+2}{(s+1)(2s-1)(s+2)}$

$\frac{2s+3}{(s+1)^2(2s-1)(s+2)} = \frac{A}{s+1} + \frac{B}{(s+1)^2} + \frac{C}{2s-1} + \frac{D}{s+2}$

$2s+3 = A(s+1)^2(2s-1)(s+2) + B(s+1) + (2s-1)(s+2) + C(s+1)(2s-1)(s+2)$
$+ D(s+1)^3(2s-1)$

$2(-1)+3 = B(-2)(1) \rightarrow B = -\frac{1}{2}$

$2(-2)+3 = D(-2+1)^2(2(-2)-1)$

$D = \frac{1}{9}$ $A = -\frac{4}{9}$

$2\left(\frac{1}{2}\right)+3 = C\left(\frac{1}{2}+1\right)^2\left(\frac{1}{2}+2\right)$

$4 = C\left(\frac{9}{4}\right)\left(\frac{5}{2}\right) \Rightarrow C = \frac{5}{18}$

$$\frac{2s+3}{(s+1)^2(2s-1)(s+2)} = \frac{1/2}{s+1} - \frac{8/9}{(s+1)^2} + \frac{5/18}{2s-1} + \frac{1/9}{s+2}$$

$$\boxed{y(t) = -\frac{8}{9}e^{-\frac{t}{2}} + \frac{1}{9}e^{-2t} + \frac{1}{2}e^{-t} + \frac{5}{18}e^{t}}$$