LAPLACE TRANSFORMS WORKSHEET

Use the table of Laplace Transforms to find the missing information in table below.

$y(t) = \mathcal{L}^{-1}\{F(s)\}$	$F(s) = \mathcal{L}\{y(t)\}$
$t^4 + 6t + 3$	$\frac{24}{s^5} + \frac{12}{s^2} + \frac{3}{s}$
e^{-4t}	$\frac{1}{s+4}$
$\sqrt{t} + 6\sqrt{t^3}$	$\frac{\sqrt{\pi}}{2s^{3/2}} + \frac{6 \cdot 3\sqrt{\pi}}{4s^{5/2}}$
$6\cos 2t - \sin 2t$	$\frac{6s-2}{s^2+4} = \frac{6s}{s^2+4} - \frac{2}{s^2+4}$
$3u(t) - (t-3)u_3(t)$	$3/s - \frac{1}{s}e^{-3s}$
$t\cos 3t$	$\frac{s^2-9}{(s^2+9)^2}$
$\delta(t-2)$	e^{-2s}
$\frac{1}{720}t^6 - 3t$	$\frac{1}{s^7} - \frac{3}{s^2}$
$t^2 \sin t + t^3 e^t$	$(-1)^2\left(\frac{1}{s^2+1}\right)'' + \frac{6}{(s-1)^4} = \left(\frac{2s}{(s^2+1)^2}\right)' + \frac{6}{(s-1)^4} = \frac{-6s^2+2}{(s^2+1)^3} + \frac{6}{(s-1)^4}$
$8(\sin t - t\cos t)$	$\frac{16}{(s^2+1)^2}$
$\frac{\cos(t)}{t}$	$\int_s^\infty \frac{s}{s^2+1}\,ds = \frac{1}{2}\ln\lvert s^2+1\rvert \Big\rvert_s^\infty$
$\delta(t-4)$	e^{-4s}
$\int_0^t e^u \sin 3u\,du$	$\frac{3}{(s-1)^2+9} \div s = \frac{3}{s[(s-1)^2+9]}$
$\frac{1}{t}\mathcal{L}^{-1}\{\sin 4s\}$	$\int_s^\infty \sin 4t\,dt$
$e^{3t} + 6e^{-2t}$	$\frac{1}{s-3} + \frac{6}{s+2}$
$3e^{-t}\cos 2t - \frac{5}{2}e^{-t}\sin 2t$	$\frac{3s-2}{(s+1)^2+4} = \frac{3(s+1)-5}{(s+1)^2+4}$
$\cos t + 4t\cos 2t$	$\frac{1}{s^2+1} + \frac{4(s^2-4)}{(s^2+4)^2}$
$u_3(t)(\cos(t-3))$	$\frac{e^{-3s}s}{s^2+1}$
$e^{-3t}u(t-3)$	$e^{-3s-9} = e^{-3(s+3)}$
$\sin(4t - \pi)$	$\frac{s\sin\pi + 4\cos\pi}{s^2+16} = \frac{-4}{s^2+16}$
$2\cosh 2t + \frac{1}{2}\sinh 2t$	$\frac{2s+1}{s^2-4} = \frac{2s}{s^2-4} + \frac{1}{s^2-4}$

$\sinh t \sin 3t = \frac{1}{2}e^{t}\sin 3t - \frac{1}{2}e^{-t}\sin 3t$	$\frac{3/2}{(s-1)^2+9} - \frac{3/2}{(s+1)^2+9}$
$\frac{2}{3}(1-\cos\sqrt{3}t)$	$\frac{2}{s(s^2+3)}$
$\frac{\sin 4t}{t}$	$\arctan\left(\frac{4}{s}\right)$
$\int_0^t e^{t-\tau}\sin\tau\,d\tau$	$\frac{1}{s-1}\cdot\frac{1}{s^2+1} = \frac{1}{(s-1)(s^2+1)}$
$\frac{2}{2\sqrt{\pi t^3}}e^{-4/4t}$	$e^{-2\sqrt{s}}$
$t\cosh t$	$\frac{s^2+1}{(s^2-1)^2}$
$\frac{1}{4}(1-e^{-2t}-2te^{-2t})$	$\frac{1}{s(s+2)^2}$
$2y''+6y'+11y=e^{-4t}$ $y(0)=1, y'(0)=2$	$2(s^2Y(s)-s-2)+6(sY(s)-1)+11Y(s)$ $=\frac{1}{s+4}$
$\frac{3e^{3t}-2e^{2t}}{3-2} = 3e^{3t}-2e^{2t}$	$\frac{s}{s^2-5s+6} = \frac{s}{(s-3)(s-2)}$
$t-3u(t)-(t^2-3)u(t-2)$	$\frac{1}{s}-\frac{3}{s}-\left(\frac{2}{s^3}+\frac{6}{s^2}+\frac{6}{s}\right)e^{-2s}$

$(t+3)^2-3$

$t^2+6t+9-3$

t^2+6t+6