1

(1)

$$
\begin{aligned}
\mathcal{L}\left[\cos(t-2)u(t-2)\right] &= e^{-2s}\mathcal{L}\left[(\cos t)u(t)\right] \\
&= e^{-2s}\frac{s}{s^2+1}
\end{aligned}
$$

(2)

$$
\begin{aligned}
\mathcal{L}\left[(t+2)u(t-2)\right] &= \mathcal{L}\left[((t-2)+4)u(t-2)\right] \\
&= e^{-2s}\mathcal{L}\left[(t+4)\right] \\
&= e^{-2s}\left(\frac{1}{s^2}+\frac{4}{s}\right) \\
&= e^{-2s}\frac{4s+1}{s^2}
\end{aligned}
$$

(3)

$$
\begin{aligned}
\mathcal{L}\left[\sin t\, u(t-\frac{\pi}{2})\right] &= e^{-\frac{\pi}{2}s}\mathcal{L}\left[\sin(t+\frac{\pi}{2})\right] \\
&= e^{-\frac{\pi}{2}s}\mathcal{L}\left[\cos t\right] \\
&= e^{-\frac{\pi}{2}s}\frac{s}{s^2+1}
\end{aligned}
$$

(4)

$$
\begin{aligned}
\mathcal{L}\left[(t^2+1)u(t-2)\right] &= e^{-2s}\mathcal{L}\left[\{(t+2)^2+1\}u(t)\right] \\
&= e^{-2s}\mathcal{L}\left[(t^2+4t+5)u(t)\right] \\
&= e^{-2s}\left(\frac{2}{s^3}+\frac{4}{s^2}+\frac{5}{s}\right) \\
&= e^{-2s}\left(\frac{5s^2+4s+2}{s^3}\right)
\end{aligned}
$$

2

$f(t)$ $\qquad$ $u(t)$

$$
f(t) = u(t)-3u(t-a)+2u(t-2a)
$$

$$
\begin{aligned}
F(s) &= \mathcal{L}[f(t)] \\
&= \frac{1}{s}\left(1-3e^{-as}+2e^{-2as}\right) \\
&= \frac{1}{s}(1-e^{-as})(1-2e^{-as})
\end{aligned}
$$

3

$f(t)$

$$
\begin{aligned}
f(t) = {}& \sin t\cdot u(t)+2\sin(t-\pi)\cdot u(t-\pi) \\
& +\sin(t-2\pi)\cdot u(t-2\pi)
\end{aligned}
$$

$F(s)$

$$
\begin{aligned}
F(s) &= \mathcal{L}[\sin t]+2\mathrm{e}^{-\pi s}\mathcal{L}[\sin t]+\mathrm{e}^{-2\pi s}\mathcal{L}[\sin t] \\
&= (1+2\mathrm{e}^{-\pi s}+\mathrm{e}^{-2\pi s})\mathcal{L}[\sin t] \\
&= \frac{(1+e^{-\pi s})^2}{s^2+1}.
\end{aligned}
$$