$$L\left\{\frac{1}{e^t}+\sqrt{t}-\sin^2 3t+\cosh t\right\}=\frac{1}{s+1}+\frac{\Gamma(\frac{3}{2})}{s^{\frac{3}{2}}}+\frac{1}{2}\left(\frac{1}{s}-\frac{s}{s^2+9}\right)+\frac{s}{s^2-1}$$

$$\sin^2 3t=\frac{1-\cos 6t}{2},\quad \Gamma(\frac{3}{2})=\frac{1}{2}\Gamma(\frac{1}{2})=\frac{\sqrt{\pi}}{2}\qquad\qquad \Gamma(\frac{1}{2})=\sqrt{\pi},\qquad\qquad \Gamma(\alpha+1)=\alpha\Gamma(\alpha)$$

$$L\{u_a(t)\}=\int_0^\infty e^{\ st}u_a(t)dt=\int_0^a e^{\ st}(0)dt+\int_a^\infty e^{\ st}(1)dt=\frac{-1}{s}e^{\ st}$$

$$L\{u_a(t)\}=\int_0^\infty e^{-st}u_a(t)dt=\int_0^a e^{-st}(0)dt+\int_a^\infty e^{-st}(1)dt=\frac{-1}{s}e^{-st}\Big|_{t=a}^{\infty}=0+\frac{1}{s}e^{-as}=\frac{e^{-as}}{s}$$

$$f(t)=\begin{cases}e^{-t} & 0<t\le 1\\ \sin t & 1<t<3\\ t^2 & t\ge 3\end{cases}\qquad f(t)=e^{-t}(u_0(t)-u_1(t))+\sin t(u_1(t)-u_3(t))+t^2(u_3(t)-u_\infty(t))=e^{-t}(1-u_1(t))+\sin t(u_1(t)-u_3(t))+t^2u_3(t)$$

$$\int_0^\infty e^{-st}\delta_a(t)dt=e^{-as}$$