8. Find the Laplace transform of $x(t) = \sinh at$

$$L[x(t)] = X(s) = \int_{-\infty}^{\infty} x(t) e^{-st} dt$$

$\sinh at = \frac{e^{at} - e^{-at}}{2}$

$$= \int_{-\infty}^{\infty} \left(\frac{e^{at} - e^{-at}}{2}\right) e^{-st} dt$$

$$= \frac{1}{2} \left[\int_{-\infty}^{\infty} e^{at} e^{-st} dt + \int_{-\infty}^{\infty} e^{-at} e^{-st} dt \right]$$

$$= \frac{1}{2} \left[L[e^{at}] - L[e^{-at}] \right]$$

$$= \frac{1}{2} \left[\frac{1}{s-a} - \frac{1}{s+a} \right]$$

$$= \frac{1}{2} \left[\frac{\cancel{s}+a-\cancel{s}+a}{s^2-a^2} \right]$$

$$= \frac{a}{s^2-a^2}$$

9. Find the L.T of $x(t) = \cosh at$

$$L[x(t)] = X(s) = \int_{-\infty}^{\infty} x(t) e^{-st} dt$$

$$= \int_{-\infty}^{\infty} \frac{e^{at} + e^{-at}}{2} e^{-st} dt$$

$$= \frac{1}{2} \left[\int_{-\infty}^{\infty} e^{at} e^{-st} dt + \int_{-\infty}^{\infty} e^{-at} e^{-st} dt \right]$$

$$= \frac{1}{2} \left[L[e^{at}] + L[e^{-at}] \right]$$

$$= \frac{1}{2} \left[\frac{1}{s-a} + \frac{1}{s+a} \right]$$

$$= \frac{1}{2} \left[\frac{\cancel{2}s}{s^2-a^2} \right]$$

$$= \frac{s}{s^2-a^2}$$