

13.5 If $f(t) = t \cos(\omega t)u(t - 1)$, find $F(s)$. **CS**

SOLUTION:

$$f(t) = e^{-at} \sin(\omega t) u(t-1)$$

$$F(s) = e^{-s} \mathcal{L} \left[e^{-a(t+1)} \sin[\omega(t+1)] \right] = e^{-(s+a)} \mathcal{L} \left[e^{-at} \sin[\omega(t+1)] \right]$$

$$F(s) = e^{-(s+a)} \mathcal{L} \left[e^{-at} (\sin \omega t \cos \omega + \cos \omega t \sin \omega) \right]$$

$$F(s) = e^{-(s+a)} \left\{ \frac{\omega \cos \omega}{(s+a)^2 + \omega^2} + \frac{(s+a) \sin \omega}{(s+a)^2 + \omega^2} \right\}$$