

1. Find the Laplace transforms of the following waveforms:

a) $\cos(\omega t)u\left(t - \frac{1}{\omega}\right), \quad \omega > 0$

b) $\frac{d}{dt}\left[e^{-at} \sin(\omega t)\right]$

c) $f(t) = ate^{-at}$

d) $\int_0^t te^{-at} dt$

2. Show that the following identity is valid for $a > 0$:

$$\mathcal{L}\{f(at)\} = \frac{1}{a}F\left(\frac{s}{a}\right)$$

3. Find the inverse Laplace transform for each of the following expressions:

a) $F(s) = \frac{4s + 11}{s^2 + 3s + 2}$

b) $F(s) = \frac{2s - 26}{s^2 + 10s + 169}$

c) $F(s) = -\frac{3s^2 + 3}{s^4}$

d) $F(s) = \frac{9s^2 + 35s + 49}{(s + 2)(s^2 + 2s + 5)}$

4. Find the inverse Laplace transform of $\frac{1}{(s + a)^n}$.