1.)

$$\mathcal{L}\left[t\cos(3t)\right] = -\frac{d}{ds}\,\frac{s}{s^2+9} = -\frac{s^2+9-2s^2}{(s^2+9)^2} = -\frac{9-s^2}{(s^2+9)^2}$$

2.)

$$\mathcal{L}\left[t\sin(5t)\right] = -\frac{d}{ds}\,\frac{5}{s^2+25} = -\frac{-10s}{(s^2+25)^2} = \frac{10s}{(s^2+25)^2}$$

3.)

$$\mathcal{L}\left[t^2\sin t\right] = (-1)^2\frac{d^2}{ds^2}\,\frac{1}{s^2+1} = \frac{d}{ds}\frac{-2s}{(s^2+1)^2}$$

$$= \frac{-2(s^2+1)^2+2s(2s)(s^2+1)+2s(s^2+1)(2s)}{(s^2+1)^4} = \frac{-2(s^2+1)^2+4s+4s}{(s^2+1)^3}$$

$$= -\frac{2(s^2+1)^2+8s}{(s^2+1)^3}$$

4.)

$$\mathcal{L}\left[te^{4t}\cos(3t)\right] = -\frac{d}{ds}F(s-4) = -\frac{d}{ds}\,\frac{(s-4)}{(s-4)^2+9} =$$

5.)

6.)

7.)

8.)

9.)

10.)

11.)

12.)