1. Using the provided table of Laplace transforms, show

$$\mathscr{L}\left\{\frac{1}{2}(\sin 3t - 3t\cos 3t)\right\} = \frac{27}{(s^2+9)^2}.$$

2. Determine the inverse Laplace transform of the following.

(a) $G(s) = \dfrac{3}{2s+1}$

(b) $F(s) = \dfrac{6}{4-s}$

(c) $N(s) = \dfrac{s}{s^2+6s+8}$

(d) $K(s) = \dfrac{7}{(s-3)^6}$

(e) $M(s) = \dfrac{2s+3}{s^2+2}$

(f) $P(s) = \dfrac{3s}{s^2-6s+13}$

3. Applying the Laplace transform to the initial value problem

$$y'' - 6y' + 9y = e^{2t}, \qquad y(0) = 3, y'(0) = 4$$

gives the following

$$Y(s) = \frac{3s^2 - 20s + 29}{(s-2)(s^2 - 6y + 9)}.$$

Determine $y(t) = \mathscr{L}^{-1}\{Y(s)\}$, the solution to the given initial value problem.

4. $\boxed{6}$ Applying the Laplace transform to the initial value problem

$$y'' + 2y' + 10y = -20e^{-2t}, \qquad y(0) = 1, y'(0) = 7$$

gives the following

$$Y(s) = \frac{s^2 + 11s - 2}{(s+2)(s^2 + 2s + 10)}.$$

Determine $y(t) = \mathscr{L}^{-1}\{Y(s)\}$, the solution to the given initial value problem.