Problem 8

In each of Problems 7 through 14, verify that each given function is a solution of the differential equation.

$$y'' + 2y' - 3y = 0; \qquad y_1(t) = e^{-3t}, \quad y_2(t) = e^t$$

Solution

$$\begin{aligned} y_1'' + 2y_1' - 3y_1 &\stackrel{?}{=} 0 \\ \frac{d^2}{dt^2}(e^{-3t}) + 2\frac{d}{dt}(e^{-3t}) - 3e^{-3t} &\stackrel{?}{=} 0 \\ 9e^{-3t} - 6e^{-3t} - 3e^{-3t} &\stackrel{?}{=} 0 \\ 0 &= 0 \end{aligned}$$

The first solution is verified.

$$\begin{aligned} y_2'' + 2y_2' - 3y_2 &\stackrel{?}{=} 0 \\ \frac{d^2}{dt^2}(e^t) + 2\frac{d}{dt}(e^t) - 3e^t &\stackrel{?}{=} 0 \\ e^t + 2e^t - 3e^t &\stackrel{?}{=} 0 \\ 0 &= 0 \end{aligned}$$

The second solution is verified.