

1. Determine the general solution $y(t)$ of each of the following ODEs :

(a) $3y'' - 14y' - 5y = 0$

(b) $4y'' + 4y' + y = 0$

2. Determine the general solution $y(t)$ of the ODE

$$y'' + 6y' + 13y = 0,$$

then determine the solution that satisfies the initial conditions $y(0) = 3$ and $y'(0) = -1$.

3. For each of the following nonhomogeneous ODEs, use either the method of undetermined coefficients or variation of parameters to determine the general solution $y(t)$:

(a) $y'' + 4y' + 5y = e^{-2t} \sec t$

(b) $y'' - 3y' - 4y = 16t - 12e^{2t}$

4. Use the Laplace transform to solve each of the following initial-value problems :

(a) $y'' - 2y' - 8y = 0, \quad y(0) = 3, \quad y'(0) = 6$

(b) $y'' - y' - 2y = 18e^{-t} \sin(3t), \quad y(0) = 0, \quad y'(0) = 3$

(c) $y'' - 3y' + 2y = 2 - 2u_4(t), \quad y(0) = 0, \quad y'(0) = 0$; recall that

$$u_4(t) = \begin{cases} 0, & \text{for } 0 \leq t < 4, \\ 1, & \text{for } t \geq 4. \end{cases}$$