

MAT 2384-Practice Problems on Solving ODEs using Laplace Transforms-

Use Laplace transforms to solve each of the following IVPs.

1. $y'' + 10y' + 24y = 144t^2$, $y(0) = \frac{19}{12}$, $y'(0) = -5$

2. $y'' + 3y' + 2y = r(t)$, $r(t) = \begin{cases} 0 & \text{if } 0 < t < 1 \\ 1 & \text{if } t > 1 \end{cases}$, $y(0) = 0$, $y'(0) = 0$

3. $y'' + 3y' + 2y = r(t)$, $r(t) = \begin{cases} t & \text{if } 0 < t < 1 \\ 0 & \text{if } t > 1 \end{cases}$, $y(0) = 0$, $y'(0) = 0$

4. $y'' + y = \delta(t - 2\pi)$, $y(0) = 10$, $y'(0) = 0$

5. $y'' + 5y' - 6y = \delta(t - 2)$, $y(0) = 1$, $y'(0) = -2$

6. $y'' + 4y' + 5y = 10(1 - u(t - 2)) - e^{10}\delta(t - 10)$, $y(0) = 0$, $y'(0) = 1$

7. $y'' + 3y' - 4y = 2e^t - 8e^2\delta(t - 2)$, $y(0) = 2$, $y'(0) = 0$

8. $y'' + 25y = 25t - 100\delta(t - \pi)$, $y(0) = -2$, $y'(0) = 5$

9. $y'' + 2y' + 5y = 25t - 100\delta(t - \pi)$, $y(0) = -2$, $y'(0) = 5$

10. $y'' + y = -2\sin t + 10\delta(t - \pi)$, $y(0) = 0$, $y'(0) = 1$