Lista 9. Resolução de EDO usando transformada de Laplace (extraídos do livro de Boyce e DiPrima)

In each of Problems 1 through 7, find the inverse Laplace transform of the given function.

1. $F(s) = \dfrac{3}{s^2+4}$

2. $F(s) = \dfrac{4}{(s-1)^3}$

3. $F(s) = \dfrac{2}{s^2+3s-4}$

4. $F(s) = \dfrac{2s+2}{s^2+2s+5}$

5. $F(s) = \dfrac{2s-3}{s^2-4}$

6. $F(s) = \dfrac{8s^2-4s+12}{s(s^2+4)}$

7. $F(s) = \dfrac{1-2s}{s^2+4s+5}$

In each of Problems 8 through 16, use the Laplace transform to solve the given initial value problem.

8. $y'' - y' - 6y = 0; \quad y(0) = 1, \quad y'(0) = -1$

9. $y'' + 3y' + 2y = 0; \quad y(0) = 1, \quad y'(0) = 0$

10. $y'' - 2y' + 2y = 0; \quad y(0) = 0, \quad y'(0) = 1$

11. $y'' - 2y' + 4y = 0; \quad y(0) = 2, \quad y'(0) = 0$

12. $y'' + 2y' + 5y = 0; \quad y(0) = 2, \quad y'(0) = -1$

13. $y^{(4)} - 4y''' + 6y'' - 4y' + y = 0; \quad y(0) = 0, \quad y'(0) = 1, \quad y''(0) = 0, \quad y'''(0) = 1$

14. $y^{(4)} - y = 0; \quad y(0) = 1, \quad y'(0) = 0, \quad y''(0) = 1, \quad y'''(0) = 0$

15. $y'' + \omega^2 y = \cos(2t), \quad \omega^2 \neq 4; \quad y(0) = 1, \quad y'(0) = 0$

16. $y'' - 2y' + 2y = e^{-t}; \quad y(0) = 0, \quad y'(0) = 1$

In each of Problems 17 through 19, find the Laplace transform $Y(s) = \mathcal{L}\{y\}$ of the solution of the given initial value problem. A method of determining the inverse transform is developed in Section 6.3. You may wish to refer to Problems 16 through 18 in Section 6.1.

17. $y'' + 4y = \begin{cases} 1, & 0 \le t < \pi, \\ 0, & \pi \le t < \infty; \end{cases} \quad y(0) = 1, \quad y'(0) = 0$

18. $y'' + 4y = \begin{cases} t, & 0 \le t < 1, \\ 1, & 1 \le t < \infty; \end{cases} \quad y(0) = 0, \quad y'(0) = 0$

19. $y'' + y = \begin{cases} t, & 0 \le t < 1, \\ 2-t, & 1 \le t < 2, \\ 0, & 2 \le t < \infty; \end{cases} \quad y(0) = 0, \quad y'(0) = 0$

In each of Problems 1 through 8:

a. Find the solution of the given initial value problem.

G b. Plot a graph of the solution.

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

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

3. $y'' + 3y' + 2y = \delta(t-5) + u_{10}(t); \quad y(0) = 0, \quad y'(0) = 1/2$

4. $y'' + 2y' + 3y = \sin t + \delta(t-3\pi); \quad y(0) = 0, \quad y'(0) = 0$

5. $y'' + y = \delta(t-2\pi)\cos t; \quad y(0) = 0, \quad y'(0) = 1$

6. $y'' + 4y = 2\delta(t-\pi/4); \quad y(0) = 0, \quad y'(0) = 0$

7. $y'' + 2y' + 2y = \cos t + \delta(t-\pi/2); \quad y(0) = 0, \quad y'(0) = 0$

8. $y^{(4)} - y = \delta(t-1); \quad y(0) = 0, \quad y'(0) = 0, \quad y''(0) = 0, \quad y'''(0) = 0$