Section 3.4, page 164

7. $y = c_1 e^t \cos t + c_2 e^t \sin t$
8. $y = c_1 e^t \cos \sqrt{5}\, t + c_2 e^t \sin \sqrt{5}\, t$
9. $y = c_1 e^{2t} + c_2 e^{-4t}$
10. $y = c_1 e^{-t} \cos t + c_2 e^{-t} \sin t$
11. $y = c_1 e^{-3t} \cos 2t + c_2 e^{-3t} \sin 2t$
12. $y = c_1 \cos(3t/2) + c_2 \sin(3t/2)$
13. $y = c_1 e^{-t} \cos(t/2) + c_2 e^{-t} \sin(t/2)$
14. $y = c_1 e^{t/3} + c_2 e^{-4t/3}$
15. $y = c_1 e^{-t/2} \cos t + c_2 e^{-t/2} \sin t$
16. $y = c_1 e^{-2t} \cos(3t/2) + c_2 e^{-2t} \sin(3t/2)$
17. $y = \frac{1}{2} \sin 2t$; steady oscillation
18. $y = e^{-2t} \cos t + 2e^{-2t} \sin t$; decaying oscillation
19. $y = -e^{t-\pi/2} \sin 2t$; growing oscillation
20. $y = (1 + 2\sqrt{3}) \cos t - (2 - \sqrt{3}) \sin t$; steady oscillation
21. $y = 3e^{-t/2} \cos t + \frac{5}{2} e^{-t/2} \sin t$; decaying oscillation
22. $y = \sqrt{2}\, e^{-(t-\pi/4)} \cos t + \sqrt{2}\, e^{-(t-\pi/4)} \sin t$; decaying oscillation
23. (a) $u = 2e^{t/6} \cos(\sqrt{23}\, t/6) - (2/\sqrt{23}) e^{t/6} \sin(\sqrt{23}\, t/6)$
    (b) $t = 10.7598$
24. (a) $u = 2e^{-t/5} \cos(\sqrt{34}\, t/5) + (7/\sqrt{34})\, e^{-t/5} \sin(\sqrt{34}\, t/5)$
    (b) $T = 14.5115$
25. (a) $y = 2e^{-t} \cos \sqrt{5}\, t + [(\alpha + 2)/\sqrt{5}]\, e^{-t} \sin \sqrt{5}\, t$
    (b) $\alpha = 1.50878$
    (c) $t = \{\pi - \arctan[2\sqrt{5}/(2 + \alpha)]\}/\sqrt{5}$
    (d) $\pi/\sqrt{5}$
26. (a) $y = e^{-at} \cos t + ae^{-at} \sin t$
    (b) $T = 1.8763$
    (c) $\alpha = \frac{1}{4}$, $T = 7.4284$; $\alpha = \frac{1}{2}$, $T = 4.3003$; $\alpha = 2$, $T = 1.5116$
35. Yes, $y = c_1 \cos x + c_2 \sin x$, $x = \int e^{-t^2/2}\, dt$
36. No
37. Yes, $y = c_1 e^{-t^2/4} \cos(\sqrt{3}\, t^2/4) + c_2 e^{-t^2/4} \sin(\sqrt{3}\, t^2/4)$
39. $y = c_1 \cos(\ln t) + c_2 \sin(\ln t)$
40. $y = c_1 t^{-1} + c_2 t^{-2}$
41. $y = c_1 t^{-1} \cos(\frac{1}{2} \ln t) + c_2 t^{-1} \sin(\frac{1}{2} \ln t)$
42. $y = c_1 t^6 + c_2 t^{-1}$

Section 3.5, page 172

1. $y = c_1 e^t + c_2 te^t$
2. $y = c_1 e^{-t/3} + c_2 te^{-t/3}$
3. $y = c_1 e^{-t/2} + c_2 e^{3t/2}$
4. $y = c_1 e^{-3t/2} + c_2 te^{-3t/2}$
5. $y = c_1 e^t \cos 3t + c_2 e^t \sin 3t$
6. $y = c_1 e^{3t} + c_2 te^{3t}$
7. $y = c_1 e^{-t/4} + c_2 e^{-4t}$
8. $y = c_1 e^{-3t/4} + c_2 te^{-3t/4}$
9. $y = c_1 e^{2t/5} + c_2 te^{2t/5}$
10. $y = e^{-t/2} \cos(t/2) + c_2 e^{-t/2} \sin(t/2)$
11. $y = 2e^{2t/3} - \frac{7}{3} te^{2t/3}$, $y \to -\infty$ as $t \to \infty$
12. $y = 2te^{3t}$, $y \to \infty$ as $t \to \infty$
13. $y = -e^{-t/3} \cos 3t + \frac{5}{9} e^{-t/3} \sin 3t$, $y \to 0$ as $t \to \infty$
14. $y = 7e^{-2(t+1)} + 5te^{-2(t+1)}$, $y \to 0$ as $t \to \infty$
15. (a) $y = e^{-3t/2} - \frac{5}{2} te^{-3t/2}$
    (b) $t = \frac{2}{5}$
    (c) $t_0 = 16/15$, $y_0 = -\frac{5}{3} e^{-8/5} \cong -0.33649$
    (d) $y = e^{-3t/2} + (b + \frac{3}{2}) te^{-3t/2}$; $b = -\frac{3}{2}$
16. $y = 2e^{t/2} + (b - 1) te^{t/2}$; $b = 1$
17. (a) $y = e^{-t/2} + \frac{5}{2} te^{-t/2}$
    (b) $t_M = \frac{8}{5}$, $y_M = 5e^{-4/5} \cong 2.24664$
    (c) $y = e^{-t/2} + (b + \frac{1}{2}) te^{-t/2}$
    (d) $t_M = 4b/(1 + 2b) \to 2$ as $b \to \infty$;
    $y_M = (1 + 2b) \exp[-2b/(1 + 2b)] \to \infty$ as $b \to \infty$
18. (a) $y = ae^{-2t/3} + (\frac{2}{3} a - 1) te^{-2t/3}$
    (b) $a = \frac{3}{2}$
23. $y_2(t) = t^3$
24. $y_2(t) = t^{-2}$
25. $y_2(t) = t^{-1} \ln t$
26. $y_2(t) = te^t$
27. $y_2(x) = \cos x^2$
28. $y_2(x) = x$