26. (a) $y_1(t) = \dfrac{1}{\mu(t)}$; $y_2(t) = \dfrac{1}{\mu(t)} \displaystyle\int_{t_0}^{t} \mu(s)g(s)\,ds$

28. $y = \pm[5t/(2 + 5ct^5)]^{1/2}$ 29. $y = r/(k + cre^{-rt})$

30. $y = \pm[\epsilon/(\sigma + c\epsilon e^{-2\epsilon t})]^{1/2}$

31. $y = \pm\left\{\mu(t) \Big/ \left[2\displaystyle\int_{t_0}^{t} \mu(s)\,ds + c\right]\right\}^{1/2}$, where $\mu(t) = \exp(2\Gamma \sin t + 2Tt)$

32. $y = \frac{1}{2}(1 - e^{-2t})$ for $0 \le t \le 1$; $y = \frac{1}{2}(e^2 - 1)e^{-2t}$ for $t > 1$

33. $y = e^{-2t}$ for $0 \le t \le 1$; $y = e^{-(t+1)}$ for $t > 1$

Section 2.5, page 84

1. $y = 0$ is unstable
2. $y = -a/b$ is asymptotically stable, $y = 0$ is unstable
3. $y = 1$ is asymptotically stable, $y = 0$ and $y = 2$ are unstable
4. $y = 0$ is unstable 5. $y = 0$ is asymptotically stable
6. $y = 0$ is asymptotically stable
7. (c) $y = [y_0 + (1 - y_0)kt]/[1 + (1 - y_0)kt]$
8. $y = 1$ is semistable
9. $y = -1$ is asymptotically stable, $y = 0$ is semistable, $y = 1$ is unstable
10. $y = -1$ and $y = 1$ are asymptotically stable, $y = 0$ is unstable
11. $y = 0$ is asymptotically stable, $y = b^2/a^2$ is unstable
12. $y = 2$ is asymptotically stable, $y = 0$ is semistable, $y = -2$ is unstable
13. $y = 0$ and $y = 1$ are semistable
15. (a) $\tau = (1/r)\ln 4$; 55.452 years (b) $T = (1/r)\ln[\beta(1 - \alpha)/(1 - \beta)\alpha]$; 175.78 years
16. (a) $y = 0$ is unstable, $y = K$ is asymptotically stable
    (b) Concave up for $0 < y \le K/e$, concave down for $K/e \le y < K$
17. (a) $y = K\exp\{[\ln(y_0/K)]e^{-rt}\}$ (b) $y(2) \cong 0.7153K \cong 57.6 \times 10^6$ kg
    (c) $\tau \cong 2.215$ years
18. (b) $(h/a)\sqrt{k/\alpha\pi}$; yes 19. (b) $k^2/2g(\alpha a)^2$
    (c) $k/\alpha \le \pi a^2$
20. (c) $Y = Ey_2 = KE[1 - (E/r)]$ (d) $Y_m = Kr/4$ for $E = r/2$
21. (a) $y_{1,2} = K[1 \mp \sqrt{1 - (4h/rK)}]/2$
22. (a) $y = 0$ is unstable, $y = 1$ is asymptotically stable
    (b) $y = y_0/[y_0 + (1 - y_0)e^{-\alpha t}]$
23. (a) $y = y_0 e^{-\beta t}$ (b) $x = x_0\exp[-\alpha y_0(1 - e^{-\beta t})/\beta]$ (c) $x_0\exp(-\alpha y_0/\beta)$
24. (b) $z = 1/[\nu + (1 - \nu)e^{\beta t}]$ (c) 0.0927
26. (a) $\lim\limits_{t\to\infty} x(t) = \min(p, q)$; $x(t) = \dfrac{pq[e^{\alpha(q-p)t} - 1]}{qe^{\alpha(q-p)t} - p}$

    (b) $\lim\limits_{t\to\infty} x(t) = p$; $x(t) = \dfrac{p^2\alpha t}{p\alpha t + 1}$

Section 2.6, page 95

1. $x^2 + 3x + y^2 - 2y = c$
2. Not exact
3. $x^3 - x^2y + 2x + 2y^3 + 3y = c$
4. $x^2y^2 + 2xy = c$
5. $ax^2 + 2bxy + cy^2 = k$
6. Not exact
7. $e^x \sin y + 2y\cos x = c$; also $y = 0$
8. Not exact
9. $e^{xy}\cos 2x + x^2 - 3y = c$
10. $y\ln x + 3x^2 - 2y = c$
11. Not exact
12. $x^2 + y^2 = c$
13. $y = \left[x + \sqrt{28 - 3x^2}\right]/2$, $|x| < \sqrt{28/3}$
14. $y = [x - (24x^3 + x^2 - 8x - 16)^{1/2}]/4$, $x > 0.9846$
15. $b = 3$; $x^2y^2 + 2x^3y = c$
16. $b = 1$; $e^{2xy} + x^2 = c$

17. $\int N(x, y)\, dy + \int \left[M(x, y) - \int N_x(x, y)\, dy \right] dx$
19. $x^2 + 2\ln|y| - y^{-2} = c$; also $y = 0$
20. $e^x \sin y + 2y \cos x = c$
21. $xy^2 - (y^2 - 2y + 2)e^y = c$
22. $x^2 e^x \sin y = c$
24. $\mu(t) = \exp \int R(t)\, dt$, where $t = xy$
25. $\mu(x) = e^{3x}$; $(3x^2 y + y^3)e^{3x} = c$
26. $\mu(x) = e^{-x}$; $y = ce^x + 1 + e^{2x}$
27. $\mu(y) = y$; $xy + y \cos y - \sin y = c$
28. $\mu(y) = e^{2y}/y$; $xe^{2y} - \ln|y| = c$; also $y = 0$
29. $\mu(y) = \sin y$; $e^x \sin y + y^2 = c$
30. $\mu(y) = y^2$; $x^4 + 3xy + y^4 = c$
31. $\mu(x, y) = xy$; $x^3 y + 3x^2 + y^3 = c$

Section 2.7, page 103

1. (a) 1.2, 1.39, 1.571, 1.7439
   (b) 1.1975, 1.38549, 1.56491, 1.73658
   (c) 1.19631, 1.38335, 1.56200, 1.73308
   (d) 1.19516, 1.38127, 1.55918, 1.72968
2. (a) 1.1, 1.22, 1.364, 1.5368
   (b) 1.105, 1.23205, 1.38578, 1.57179
   (c) 1.10775, 1.23873, 1.39793, 1.59144
   (d) 1.1107, 1.24591, 1.41106, 1.61277
3. (a) 1.25, 1.54, 1.878, 2.2736
   (b) 1.26, 1.5641, 1.92156, 2.34359
   (c) 1.26551, 1.57746, 1.94586, 2.38287
   (d) 1.2714, 1.59182, 1.97212, 2.42554
4. (a) 0.3, 0.538501, 0.724821, 0.866458
   (b) 0.284813, 0.513339, 0.693451, 0.831571
   (c) 0.277920, 0.501813, 0.678949, 0.815302
   (d) 0.271428, 0.490897, 0.665142, 0.799729
5. Converge for $y \geq 0$; undefined for $y < 0$
6. Converge for $y \geq 0$; diverge for $y < 0$
7. Converge
8. Converge for $|y(0)| < 2.37$ (approximately); diverge otherwise
9. Diverge
10. Diverge
11. (a) 2.30800, 2.49006, 2.60023, 2.66773, 2.70939, 2.73521
    (b) 2.30167, 2.48263, 2.59352, 2.66227, 2.70519, 2.73209
    (c) 2.29864, 2.47903, 2.59024, 2.65958, 2.70310, 2.73053
    (d) 2.29686, 2.47691, 2.58830, 2.65798, 2.70185, 2.72959
12. (a) 1.70308, 3.06605, 2.44030, 1.77204, 1.37348, 1.11925
    (b) 1.79548, 3.06051, 2.43292, 1.77807, 1.37795, 1.12191
    (c) 1.84579, 3.05769, 2.42905, 1.78074, 1.38017, 1.12328
    (d) 1.87734, 3.05607, 2.42672, 1.78224, 1.38150, 1.12411
13. (a) −1.48849, −0.412339, 1.04687, 1.43176, 1.54438, 1.51971
    (b) −1.46909, −0.287883, 1.05351, 1.42003, 1.53000, 1.50549
    (c) −1.45865, −0.217545, 1.05715, 1.41486, 1.52334, 1.49879
    (d) −1.45212, −0.173376, 1.05941, 1.41197, 1.51949, 1.49490
14. (a) 0.950517, 0.687550, 0.369188, 0.145990, 0.0421429, 0.00872877
    (b) 0.938298, 0.672145, 0.362640, 0.147659, 0.0454100, 0.0104931
    (c) 0.932253, 0.664778, 0.359567, 0.148416, 0.0469514, 0.0113722
    (d) 0.928649, 0.660463, 0.357783, 0.148848, 0.0478492, 0.0118978
15. (a) −0.166134, −0.410872, −0.804660, 4.15867
    (b) −0.174652, −0.434238, −0.889140, −3.09810
16. A reasonable estimate for y at $t = 0.8$ is between 5.5 and 6. No reliable estimate is possible at $t = 1$ from the specified data.