

Errata for
Ordinary Differential Equations with Boundary Value Problems: A Systems Approach,
 by Bruce P. Conrad

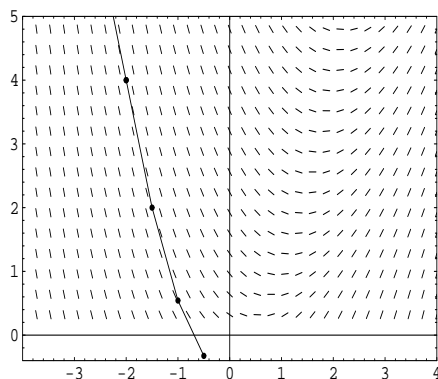
Corrections to Example 1.3.3 on page 20: The transmission coefficient should be $k = 0.2 \text{ hour}^{-1}$, not 0.05 hour^{-1} , as printed. In detail, the numbers ± 0.05 should be replaced with ± 0.2 in the statement and solution of this example at each occurrence.

Location	Change	To
Page 15, lines –17	If the object is colder than the environment, its temperature will decrease, and ...	If the object is warmer than the environment, its temperature will decrease, and ...
Page 50, line 4	equation (i)	the ODE
Page 51, line 11	equation (ii)	the ODE
Page 113, line 5	$y = Ce^{2t}$	$x = Ce^{2t}$
Page 124, Exercise 14	... an stationary point.	... a stationary point.
Page 144, Exercise 5	$x(0) = 1$	$x(0) = 2$
Page 147, last line	$m = \frac{k}{h}n$ and $p = \frac{k}{h}q$	$m = -\frac{k}{h}n$ and $p = -\frac{k}{h}q$
Page 148, second line	$\frac{k}{h}nq - \frac{k}{h}qn$	$-\frac{k}{h}nq + \frac{k}{h}qn$
Page 168, line –2	$\begin{bmatrix} d/\det(P) & -b/\det(P) \\ -c/\det(P) & a/\det(P) \end{bmatrix}$	$\begin{bmatrix} d/\det(P) & -c/\det(P) \\ -b/\det(P) & a/\det(P) \end{bmatrix}$
Page 200, last line	for purposes	for other purposes
Page 218, Ex. 23(a)	Last term in formula should be multiplied by t^{p-2} .	
Page 256 line –7	$\frac{1}{\sqrt{t}}e^{-st}$	$\frac{1}{\sqrt{t}}e^{-st} < \frac{1}{\sqrt{t}}$
Page 294, missing caption	Caption of Fig. 6.15: In this circuit, the capacitance is $C = 0.001$ farad, the inductance is $L = 0.1$ henry, and there is no resistance. The EMF is $E = 600$ volts when the switch is in position A . See Exercise 31.	
Page 342, line –5	It named for	It is named for
Page 359, Exercise 30.	$W[I_n, I_{-n}]$	$W[I_\nu, I_{-\nu}]$
Page 369, Answer to Exercise 7	$y_1(t) = y(t, \frac{1}{2}) = \sqrt{t} \left\{ 1 - \sum_{m=1}^{\infty} \frac{(4m-3)!!}{2^{6m}(m!)^2} t^{2m} \right\};$ $y_2 = y_1 \ln(t) + t^{1/2} \sum_{m=1}^{\infty} B_{2m} t^{2m}$, where $B_{2m} = -\frac{(4m-3)!!}{2^{6m}(m!)^2} (2\phi(4m-3) - \phi(2m-2) - 2 - \frac{1}{2}\phi(m))$.	
Page 370, Answer to Exercise 8c	$y_2(t) = 2y_1(t) \ln(t) + \dots$	$y_2(t) = y_1(t) \ln(t) + \dots$
Page 370, replace Exercise 14 with	Show that $\bar{y}_2(t) = -K y_1(t) + y_2(t)$, where $K = \int_0^1 \frac{e^\tau - 1}{\tau} d\tau$. Hint: It will be helpful to show that $\lim_{t \rightarrow 0} \frac{\bar{y}_2(t) - y_2(t)}{t}$ is finite.	
Page 386, second line before exercises	only special property to the system	only special property of the system

Location	Change	To
Page 391 line 4	simple	semisimple
Page 391 line 4	simple	semisimple
Page 391 lines 6-8	Sentence “Thus, i is a ... Example 8.2.1	For example, a characteristic root of multiplicity 1 (a <i>simple</i> root) is semisimple, and every characteristic root of a diagonal matrix is semisimple.
Page 391, lines 13,20; page 392, line 1; page 393, lines -3, -2.	simple	semisimple
Page 428, new entry	Semisimple characteristic root	A characteristic root of a matrix with multiplicity (as a root of the characteristic equation) equal to the maximum number of linearly independent characteristic vectors belonging to it.
Page 504 Exercise 9	(10.52) and (10.53)	(10.55)
Page 504, Ex. 11 (line 4)	$\phi(x)$.	$\phi(x)$, where α, β , and c are positive numbers.
Page 504, Ex. 11(a)	c	m
Page 518, Ex. 10	Part (d) should be moved so that it is part (a); parts (a), (b), and (c) become parts (b), (c), and (d), respectively.	
Page 535, Ex. 4	of	on
Page 553, line -9	evaluated two graphs	evaluated numerically by using a CAS. To test the accuracy of the approximation, Figure 11.7 displays graphs
Page 557	Robin Problem. The second	Robin Problem. The third
Page 558, Ex. 1	$u(0, x) = e^{-x} \sin(x/2)$	$u(x, 0) = e^{-x} \sin(x/2)$

Corrections to the Answers

On page A-8, The answer to Exercise 4 of section 2.7 is missing. The answers numbered 4 through 26 should be numbered 5 through 27, and the following figure should be inserted as the answer to Exercise 4:



Page	Section	Answer	Replacement
A-17	4.5	7b	Change $+6t^2$ to $-6t^2$.
A-17	5.1	4	The answers shown are for parts (a), (c), and (e), not Exercises 4, 6, and 8, as indicated.
A-23	5.11	14a	$e^t(t - 2)$
A-24	6.2	7a	$\begin{cases} x' = \frac{1}{24}(I - 2x + 6) \\ I' = \frac{5}{24}(-23I - 2x + 6) \end{cases}$ <p>The Laplace transforms of the charge and the current are $\frac{6(5 + s)}{s(10 + 117s + 24s^2)}$, and $\frac{6(5 + s)}{s(10 + 117s + 24s^2)}$, respectively. The inverse Laplace transforms of these expressions are rather complicated, and are not shown. The graphs of the charge and current, assuming homogeneous initial conditions, are as follows.</p>
A-24	6.2	8a	<div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;"> <p>Charge</p> </div> <div style="text-align: center;"> <p>Current</p> </div> </div>

A-25 6.4 31(c)

$$x(t) = \frac{1}{8} + \frac{1}{697}(144 \cos(6t) - 66 \sin(6t)) - \frac{e^{-st}}{5576}(1849 \cos(4t) + 2906 \sin(4t))$$

A-26 6.6 15

$y \approx 2e^{-5t} \cos(10^4 t)$. With the decreased inductance, the initial magnitude of the current has increases from 10^{-4} amperes to 2 amperes, but the exponential damping factor decreases more rapidly than in the high inductance case. If there is no choke coil an initial surge of 2 million amperes would be observed.

Resonance occurs when k is an odd multiple of π , and in this case the resonant solution is

A-27 6.8 9

$$y(t) = \frac{1}{(m\pi)^2} [\Lambda(t) + \cos(m\pi t) + \frac{2 \sin(m\pi t)}{m\pi} (2[t] - 1)]$$

A-28 6.10 28

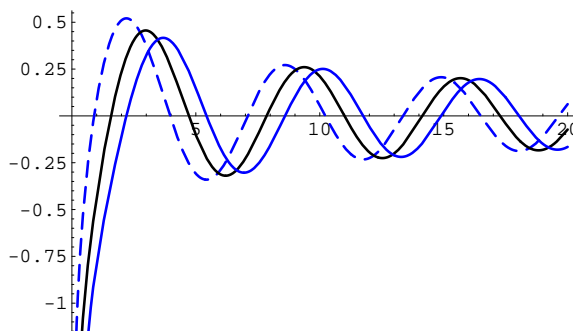
$$L\left(\frac{1}{[t] + 1}\right) = \frac{1}{s} \left(1 - \sum_{k=1}^{\infty} \frac{e^{-sk}}{k(k+1)}\right), \text{ or, in closed form, } \frac{1}{s}(1 - e^s) \ln(1 - e^{-s}).$$

A-28 6.10 29

$$I = 12 \sin(10t) \frac{e^{-10t + \lfloor \frac{10t}{\pi} \rfloor \pi}}{1 - e^{-\pi}}$$

In the following graph, the blue dashed curve represents $y = Y_0(t)$, the solid black curve is $y = Y_{1/2}(t) = -\sqrt{\frac{2}{\pi t}} \cos(t)$, and the solid blue curve is $Y_1(t)$.

A-29 7.5 10

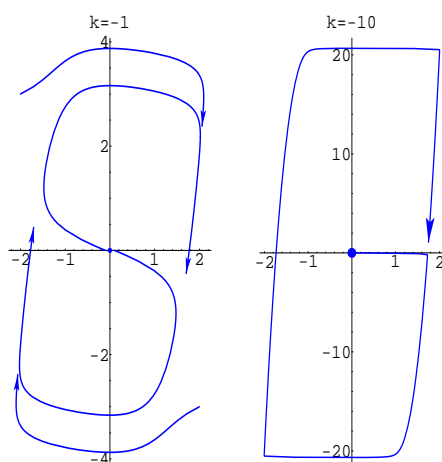


A-34 8.6 19

If $q(x, y)$ is negative semidefinite, $L(x, y)$ is still a Lyapunov function for the system, and the origin is a stable stationary point that may or may not be asymptotically stable.

The system has a limit cycle for any negative value of k .

A-34 8.6 23

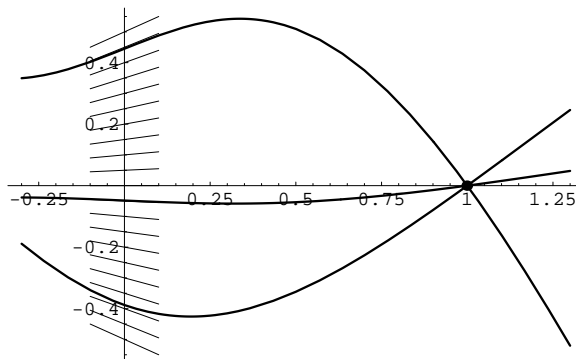


A-36 9.3 5

$$P_{2\pi} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -2 \\ 1 \end{bmatrix} + e^{-2\pi} \begin{bmatrix} x + 2 \\ y - 1 \end{bmatrix}$$

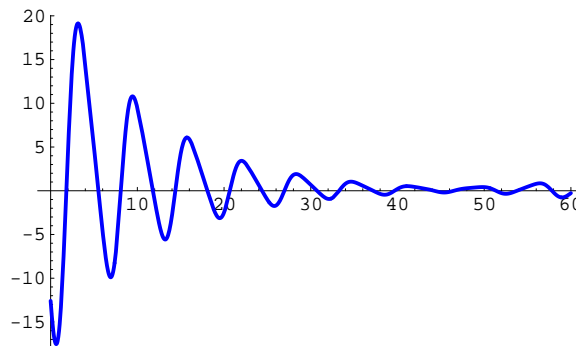
A-37 10.1 1 The BVP has a unique solution unless λ is of the form k^2 , where k is a nonzero integer.

$$G(t, u) = \begin{cases} (1 + u^2) \frac{(\arctan(u)-1)(\arctan(t)-\pi/4)}{\pi/4-1} & \text{if } u \leq t, \\ (1 + u^2) \frac{(\arctan(t)-1)(\arctan(u)-\pi/4)}{\pi/4-1} & \text{if } u > t. \end{cases}$$



A-37 10.1 13

A-37 10.1 15a $A_1 B_2 - A_2 B_1 \neq 0$.



A-38 10.1 22(e)

A-41 11.2 11 $u(x, y) = C + \frac{1}{\sinh(\pi)} \cosh(x) \cos(y)$, where C is a constant.

A-41 11.2 13 $u(x, y) = C - \frac{4}{\pi} \sum_{k=0}^{\infty} \frac{\cos((2k+1)x) \cosh((2k+1)y)}{(2k+1)^3 \sinh((2k+1)\pi)}$

A-41 11.3 6a $v(r, \theta) = \sum_{m=1}^{\infty} \frac{2(-r)^m}{m^2} \sin(m\theta)$

A-41 11.3 6c $v(r, \theta) = \sum_{k=0}^{\infty} \frac{4}{(2k+1)^2 \pi} r^{2k+1} \sin((2k+1)\theta)$

This answer should be renumbered 5. The following is a corrected version. The eigenvalues are $\lambda_0 = 0$, and $\lambda_n = \omega_n^2$, where $r = \omega_1, \omega_2, \dots$ are the positive roots of $J_1(r) = 0$. The eigenfunctions are $\phi_0(r) \equiv 1$ and $\phi_n(r) = J_0(\omega_n r)$, and they satisfy the orthogonality relation $\int_0^1 \phi_m(r) \phi_n(r) r dr = 0$ for $m \neq n$.

A-42 11.5 4

A-42 11.5 6 This answer should be renumbered 7.