

# Differential Dynamical Systems — Errata (2nd & 3rd Printings)

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Errors are listed by page and line number. The symbol  $\implies$  means “replace with”. A negative line number means count from the bottom of the page. Each equation line is counted as one line.

Note that the first printing has 10 9 8 7 6 5 4 3 2 1 on the copyright page. The second printing was out in March 2009, and has 10 9 8 7 6 5 4 3 2 on the copyright page. The third printing was out in 2011, and did not have any changes from the 2nd.

Ch.	Page	Line	Change	Thanks
1	8	2	as $t \rightarrow \infty \implies$ as $t$ increases	
	16	3	in the interior of $E \implies$ in the interior of $M$	II
	16	3	in the interior of $E \implies$ in the interior of $M$	II
	16	14	$M \setminus R \implies \text{int}(M) \setminus R$	JGR
	21	10(1.32)	$\frac{4\pi^2}{LH}AC \implies \frac{\pi^2}{LH}AC, \frac{\pi^2}{LH}AB \implies \frac{\pi^2}{2LH}AB, \frac{4\pi^3}{H^2}C \implies \frac{4\pi^2}{H^2}C$	TB
	24	1,12	Menton $\implies$ Menten	JGR
2	41	3	any operator $\implies$ any linear operator	JGR
	50	7	$\lambda_k$ is an eigenvector $\implies \lambda_k$ is an eigenvalue	PM
	58	-1	Consequently, $\implies$ for any $x_0 \in E^s$ , the stable subspace of A. Consequently,	HLS
	63	-12	solutions (2.48) $\implies$ solutions (2.49)	AR
	66	-6	$M^2 = e^{TR} \implies M^2 = e^{2TR}$	MS
	67	-5	$t \in R \implies t \in \mathbb{R}$	
	68	8	Replace (d) with: Finally argue that if $e^{tA}e^{tB} = e^{t(A+B)}$ then differentiation with respect to time implies that $F(t) = G(t)$ . By differentiating again, finally show that $[A, B] = 0$ .	
	3	76	-4	For a function $\implies$ If a function
76		-3	the derivative at $\implies$ is differentiable then the derivative at	TB
78		-2	normed space $\implies$ metric space	TB
80		4	$f_j \in Y \in X \implies f_j \in Y \subset X$	
83		-14	to arbitrary compact sets. $\implies$ to arbitrary compact sets using the following lemma.	
83		-13	Corollary 3.8 $\implies$ Lemma 3.8	
92		16	on $J = [t_o - a, t_o + a] \implies$ on $J = [t_o - c, t_o + c]$	
92		-14	for $t \in J$ and $a = b/M \implies$ for $t \in [t_o - a, t_o + a]$ and $a = \min(c, b/M)$	TB
92		-6	before ‘‘This result’’ add the sentence: ‘‘Using Picard iteration or Theorem 3.18, the interval of existence can be extended to the entire interval $J$ .’’	TB
94		-3	$b \implies g$	TB
96		-5	Before ‘‘Consequently’’ add the sentence: ‘‘However since $u \in B_b(x_o)$ then, by the argument sketched in Exercise 2, $f$ is uniformly $C^1$ on this compact set and we can assume that $\delta(\varepsilon)$ only.’’	TB
97		4	$= \delta(\varepsilon, b) \implies = \delta(\varepsilon)$	
99		7	$B_b(x_o) \implies B_{b_o}(x_o)$ (Two places!)	AGH
99		7	$\lim_{t \rightarrow a_o} \implies \lim_{t \rightarrow t_o + a_o}$	MS
102	-4	$[t_o - a, t_o + a] \implies [t_o - c, t_o + c]$		
102	-1	for $t \in J \implies$ for $t \in [t_o - a, t_o + a]$		

Ch.	Page	Line	Change	Thanks
	103	12	In the exponent, $2K$ should be $K$ .	RC
	103	-10	$\ A\  < M \implies \ A\  \leq M$ .	
	103	-6	on $[0, b) \implies$ on $[0, b]$ .	
	103	-5	use Theorem 3.18 to $\implies$ extend Theorem 3.18 to the nonautonomous case to	HLS
4	107	-10	the orbit (4.2). $\implies$ the orbit $\Gamma_x$ .	MS
	110	4	defines a complete flow $\implies$ exists for all $t \in \mathbb{R}$	MS
	110	10	Theorem 3.17 $\implies$ Theorem 3.18	JA
	110	13	Delete the sentence “The solution defines a flow by Lemma 4.2”	SR
	110	-10	The vector field $F$ defines a flow on $\mathbb{R}^n \implies$ The solutions exist for all $t \in \mathbb{R}$	MS
	111	10	Delete “, and therefore define a flow”	MS
	111	-11	Theorem 3.17 $\implies$ Theorem 3.18	JA
	113	-1	when $E^c$ is empty $\implies$ when $E^c$ is trivial	RC2
	121	6	$f_i(x^* + \delta x_j) \implies f_i(x^* + \delta x_j \hat{e}_j)$ AND $g_i(\delta x_j) \implies g_i(\delta x_j \hat{e}_j)$	
	122	11	$ y_o \leq \delta  \implies  y_o  \leq \delta$	
	130	-10	$ a  < 1 \implies  a  \leq 1$	
	130	Ftnt 24	“continuous, bijective map that” $\implies$ “continuous, bijective map between compact sets that”	SS
	131	4	“itself, and thus” $\implies$ “itself with a $C^1$ inverse, and thus”	SS
	132	-10	“map $\tau$ ” $\implies$ “surjective map $\tau$ ”	HLS
	132	-5	$t \in (y^{-1}, \infty) \implies t \in (-y^{-1}, \infty)$	
	136	-6	$= (h_2(x_1, x_2) + tx_2) \implies = (h_1(x_1, x_2) + tx_2)$	SS2
	139	-6	$e^{-tA} \cdot H_1 \cdot \varphi_t(x) \implies e^{-tA} \circ H_1 \circ \varphi_t(x)$	
	145	12-14	Replace with “ $z \in \bar{\Gamma}_{\varphi_T(x)}^+$ . There are now two possibilities: $z$ may be a point in $\Gamma_{\varphi_T(x)}^+$ for each $T \geq 0$ or not. In the first case there must be infinitely many times $t_n \rightarrow \infty$ such that $z = \varphi_{t_n}(x)$ implying that $z$ is a limit point and thus in $\omega(x)$ . In the latter case there is some time $T \geq 0$ for which $z \notin \Gamma_{\varphi_T(x)}^+$ . Since by assumption $z$ is in the closure of $\Gamma_{\varphi_T(x)}^+$ , then by”	RM
	145	-16	$\in \omega(s) \implies \in \omega(x)$	MS
	148	18	$\omega(x) \in B \implies \omega(x) \subset B$	MS
	148	-16	Lemma 4.14 $\implies$ Lemma 4.15	MS
	148	-6	“is a subset $M$ of $N$ ” $\implies$ is a neighborhood $M \subset N$	MS
	150	8	an attractor $\implies$ an attracting set	JGR

Chap.	Page	Line	Change	Thanks to
	158	15-22	<p>Replace these lines with <math>\implies</math>  basis vectors perpendicular to <math>f(x_o)</math>, then <math>WW^T</math> is the projection onto <math>S</math> where <math>W = (w_1, w_2, \dots, w_{n-1})</math>. The matrix <math>DP</math> in the <math>w_i</math> basis has the representation <math>W^T DQ(x_o)W</math>. Since <math>W^T f(x_o) = 0</math>, we obtain</p> $DP(x_o) = W^T M W .$ <p>Now add the unit vector <math>\hat{f} = f(x_o)/ f(x_o) </math> to <math>W</math> to form the orthogonal matrix <math>U = (W, \hat{f})</math>. The spectrum of <math>M</math> is identical to that of the similar matrix</p> $\tilde{M} = U^T M U = \begin{pmatrix} DP(x_o) & 0 \\ \hat{f}^T M W & 1 \end{pmatrix} .$ <p>Because the last column has only one nonzero element, <math>\det(\lambda I - \tilde{M}) = (\lambda - 1) \det(\lambda I - DP(x_o))</math>. <math>\square</math></p>	HPR
	163	10	$\mathbb{R}^+ \times \mathbb{S} \implies [0, \infty) \times \mathbb{S}$	
5	173	-11	$Df(x_o) = A \implies Df(x^*) = A$	TB
	177	-5	Replace this line with $\implies$ any $t$ and any $\varepsilon > 0$ there is a $T \geq t$ such that $v(t) \leq u(T) + \varepsilon$ . Thus, using (5.22), gives	SS & MS
	177	-4,-2,-1	for each equation $\implies$ add an $\varepsilon$ to the right hand side of each of the three inequalities.	
	178	1	$u(T + s) \leq v(T) = v(t) \implies u(T + s) \leq v(t)$	
	178	5	$z(t) \leq M + \frac{L}{\beta} \int_0^t z(s) ds \implies z(t) \leq M + \varepsilon e^{\alpha t} + \frac{L}{\beta} \int_0^t z(s) ds$	
	178	6	replace this line with $\implies$ This is of the form of the Grönwall's lemma in Ex. 3.9, so that $z(t) \leq (M + \varepsilon e^{\alpha t}) e^{tL/\beta}$ . Since this is true for <i>any</i> $\varepsilon > 0$ , rewriting it in	
	186	3	where $E^c$ is empty. $\implies$ where $E^c$ is trivial.	MS
	186	5	where $E^c$ is not empty. $\implies$ where $E^c \neq \{0\}$ .	MS
	186	14	$C^k$ invariant manifolds $\implies C^k$ locally invariant manifolds	TB
	190	-7	$\dot{z} = z \implies \dot{z} = \lambda z$	MS
6	222	9	$\Sigma \in \varphi_{t_n} \implies \Sigma \ni \varphi_{t_n}$	JGR
	220	13-14	such that $f(x) \neq 0$ for all $x \in \Sigma \implies$ such that whenever $x \in \Sigma$ , $f(x)$ is transverse to $\Sigma$	TB
	222	-8	The sixteenth $\implies$ Part of the sixteenth	
	222	-6-7	Replace the phrase beginning "to show" with $\implies$ "to find an upper bound for the number of limit cycles for a polynomial vector field on $\mathbb{R}^2$ ."	JMG
	222	-2	(Shi, 1988) $\implies$ (Shi, 1980)	HPR
	223	1	$\lambda = 10^{-200} \implies \lambda = -10^{-200}$	HPR
	223	3	unstable foci $\implies$ foci	HPR

Chap.	Page	Line	Change	Thanks to	
7	245	-8	$\theta_1(t_n) = \alpha_n \implies \theta_1(t_n) = \alpha_1$	TB	
	251	1	$\Phi(t; xv) \implies \Phi(t; x)v$		
	253	-1	$\mu(x, v) \implies \mu(x, v(0))$	JGR	
	256	3	In equation (7.21) flip the sign of both $x$ 's in the matrix		
	259	2	When $\mu_1 < \mu_2 \implies$ When $\mu_1 \leq \mu_2$	JGR	
	260	-7	of a set $S \implies$ of a bounded set $S$		
	263	-2	$\mu_1 + \mu_2 \leq \text{tr}(Df) \implies \mu_1 + \mu_2 \geq \text{tr}(Df)$		
	263	-1	Thus there $\implies$ Thus if the spectrum is regular there		
	265	12	then $\mu = \text{Re}(\lambda) \implies$ then $\mu = \frac{1}{T}\text{Re}(\lambda)$		
	265	-6	that $\chi(F) \leq \chi(f) \implies$ that $\chi(F) \leq \max(0, \chi(f))$		AML, ASD
8	269	-11	that as $\mu \rightarrow \infty \implies$ that as $\mu \rightarrow -\infty$	SS2	
	271	-6	$(x_o, \mu_0) \implies (x_o, \mu_0)$		
	274	1-2	Replace sentence with "The range of dynamics of the induced vector field $f$ can be as rich as those of $g$ , but may also be simpler."	MS	
	274	19	$= Dh f(x; p(\nu)) \implies = Dh(x; p(\nu))f(x; p(\nu))$	MS	
	274	20	of $(0, 0)$ . $\implies$ of $(0, 0)$ , recall (4.34).	MS	
	275	Fig 8.5	$f(x; \nu) \implies f(x; \mu)$	MS	
	280	Fig 8.7	$\alpha(\mu) \implies m(\mu)$		
	280	-1	Using the definition (8.16) of $m$ , $\implies$ Using $m(\mu) = f(\xi(\mu); \mu)$ ,	MS	
	289	-1	$1 + \beta + r^2 \implies 1 + \beta r^2$	AA AA	
	290	-6	$g_1(x; \eta(\mu), \mu) \implies g_1(x; \eta(x; \mu), \mu)$		
	294	Fig 8.9	of (8.49) for $\implies$ of (8.46) for		
	294	-7	$b = 1 \implies b = -1$		
	303	-9	$f : C^3( \implies f \in C^3($		
	303	-7	$D_x^2 f(0; 0) \implies D_x^2 f(0; 0) = 0$		
9	361	8	$(2n - 1)n \implies (2n + 1)n$		
	362	4	$(2n - 1)n \implies (2n + 1)n$		
	371	-8	$ m \cdot \omega  > c \implies  m \cdot \omega  \geq c$		
	371	-7	The set $\mathcal{D}_{c,\tau}$ is a $\implies$ The set $\mathcal{D}_{c,\tau} \cap \mathbb{S}^{n-1}$ is a		
	371	-1	$> \frac{d}{ q ^{\tau+1}} \implies \geq \frac{d}{2 q ^{\tau+1}}$		
	372	1	with $d = c/\omega_2 \implies$ with $d = 2c/\omega_2$		
	372	4	$[0, d/2]$ and $[1- \implies [0, d/2]$ and $(1-$		
	App	394	3	<code>meshgrid(-pi,pi/10,pi)</code> $\implies$ <code>meshgrid(-pi:pi/10:pi)</code>	
Ref	405	Shi	Replace with $\implies$ Shi, S. L. (1980). "A Concrete Example of the Existence of Four Limit Cycles for Plane Quadratic Systems." <i>Sci. Sinica</i> 23(2): 153-158.		