CORRECTIONS TO
Introduction to Smooth Manifolds (Second Edition)
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(8/16) Page 6, just below the last displayed equation: Change $\varphi([x])$ to $\varphi_{n+1}[x]$, and in the next line, change $x^i$ to $x^{n+1}$. After “(Fig. 1.4),” insert “with similar interpretations for the other charts.”

(8/16) Page 7, Fig. 1.4: Both occurrences of $x^i$ should be $x^{n+1}$.

(12/19/18) Page 9, proof of Theorem 1.15: In the second line of the proof, replace “For each $j$” with “For each $j \geq 0.”
Then in the fourth-to-last line, replace “positive integers” by “nonnegative integers.”

(1/15/21) Page 13, line 1: Delete the words “and injective.”

(1/18/21) Page 20, Example 1.31: There are multiple errors in this example. Replace everything after the first two sentences by the following: For each $i = 1, \ldots, n+1$, let $(U_i^\pm \cap S^n, \varphi_i^\pm)$ denote the graph coordinate charts we constructed in Example 1.4. For any distinct indices $i$ and $j$ and any choices of $\pm$ signs, the transition maps $\varphi_i^\pm \circ (\varphi_j^\pm)^{-1}$ and $\varphi_i^\pm \circ (\varphi_j^\pm)^{-1}$ are easily computed. For example, in the case $i < j$, we get the following formula for all $u$ in the domain of $\varphi_i^+ \circ (\varphi_j^+)^{-1}$:

\[
\varphi_i^+ \circ (\varphi_j^+)^{-1} (u^1, \ldots, u^n) = (u^1, \ldots, \hat{u}^i, \ldots, \hat{u}^j, \sqrt{1-|u_j|^2}, \ldots, u^n)
\]

(with $u^i$ omitted and the square root replacing $u^j$), and similar formulas hold in the other cases. When $i = j$, the domains of $\varphi_i^+$ and $\varphi_i^-$ are disjoint, so there is nothing to check. Thus, the collection of charts $\{(U_i^\pm \cap S^n, \varphi_i^\pm)\}$ is a smooth atlas, and so defines a smooth structure on $S^n$. We call this its standard smooth structure.

(6/23/13) Page 23, two lines below the first displayed equation: Change “any subspace $S \subseteq V$” to “any $k$-dimensional subspace $S \subseteq V$.”

(9/15/19) Page 24, first full paragraph, fourth line: Change “any subspace $S$” to “any $k$-dimensional subspace $S$.”

(12/19/18) Page 26, first line: Change $U \cap \varphi^{-1}(\text{Int } \mathbb{H}^n)$ to $\varphi^{-1}(\text{Int } \mathbb{H}^n)$.

(12/19/18) Page 27, last paragraph, sixth line: Change $\bar{U} \cap \mathbb{H}^n$ to $\bar{U} \cap U$.

(2/22/15) Page 29, proof of Theorem 1.46, second paragraph, line 4: Change $\varphi(U \cap V)$ to $\psi(U \cap V)$.

(10/8/15) Page 30, Problem 1-6: Interpret the formula for $F_x$ to mean $F_x(0) = 0$ when $s \leq 1$.

(1/27/18) Page 31, Fig. 1.13: Change $\{x^n = 0\}$ to $\{x^{n+1} = 0\}$.

(3/12/17) Page 31, Problem 11, next-to-last line: Change $S^n$ to $S^n \setminus \{N\}$.

(4/25/17) Page 45, second paragraph: Replace the last sentence of that paragraph with the following: “If $N$ has empty boundary, we say that a map $F: A \to N$ is smooth on $A$ if it has a smooth extension in a neighborhood of each point: that is, if for every $p \in A$ there exist an open subset $W \subseteq M$ containing $p$ and a smooth map $\tilde{F}: W \to N$ whose restriction to $W \cap A$ agrees with $F$. When $\partial N \neq \emptyset$, we say $F: A \to N$ is smooth on $A$ if for every $p \in A$ there exist an open subset $W \subseteq M$ containing $p$ and a smooth chart $(V, \psi)$ for $N$ whose domain contains $F(p)$, such that $F(W \cap A) \subseteq V$ and $\psi \circ F|_{W \cap A}$ is smooth as a map into $\mathbb{R}^n$ in the sense defined above (i.e., it has a smooth extension in a neighborhood of each point).”

(7/23/14) Page 45, last displayed equation: The first $=$ sign should be $\subseteq$.

(9/15/19) Page 46, line 9: Change “on an open subset” to “on a nonempty open subset.”
Page 113, line 6: Change the definition of $\tilde{\psi}$ to $\tilde{\psi} = \pi \circ \psi|_{V_0}$. After the end of that sentence, insert the following: “To see that $\tilde{\psi}$ is a smooth coordinate map, let $i: V \hookrightarrow M$ be the inclusion map. Note first that for each $q \in V_0$, $x^{k+1}, \ldots, x^n$ are all constant on the image of $i$, so the image of $di_q$ is contained in the span of $\partial\partial x^1, \ldots, \partial\partial x^k$. Since $dl_q$ is injective and its image has trivial intersection with Ker $d\tilde{\psi}_q$, it follows that $d\tilde{\psi}_q \circ di_q$ is injective, so for dimensional reasons it is an isomorphism. Thus $\tilde{\psi} \circ i$ is a local diffeomorphism by the inverse function theorem. Since it is bijective from $V_0$ to its image, it is a diffeomorphism and hence a smooth coordinate map for $V$.”

Page 118, Fig. 5.13: Change $N$ to $v$.

Page 119, third line: Starting in the middle of that line, replace the rest of the proof with the following: “For each $\alpha$ such that $p \in U_\alpha$, we have $f_\alpha(p) = 0$ and $v(f_\alpha) = v^n > 0$ by Proposition 5.41. Thus
\[v(f) = \sum_{\alpha} (f_\alpha(p)v(\psi_\alpha) + \psi_\alpha(p)v(f_\alpha)).\]

For each $\alpha$, the first term in parentheses is zero and the second is nonnegative, and there is at least one $\alpha$ for which the second term is positive. Thus $v(f) > 0$, which implies that $df_p(v) = (vf)d/dt|_{f(p)} \neq 0$, where $t$ is the standard coordinate on $\mathbb{R}$.

Page 120, proof of Proposition 5.46: At the beginning of the proof, insert this sentence: “Let $F: D \hookrightarrow M$ denote the inclusion map.”

Page 121, line 5: Change $x^m$ to $x^n$.

Page 123, Problem 5-6: Add the assumption that $m > 0$.

Page 124: At the end of the page, add a new problem:
5-24. Suppose $M$ is a smooth manifold with boundary, $N$ is a smooth manifold, and $F: N \to M$ is a smooth map whose image is contained in $\partial M$. Show that $F$ is smooth as a map into $\partial M$, and use this to prove that $\partial M$ has a unique smooth structure making it an embedded submanifold of $M$.

Page 129, proof of Sard’s theorem, second paragraph: Just before the last sentence of the paragraph, insert the following: “In the $\mathbb{H}^n$ case, extend $F$ to a smooth map on an open subset of $\mathbb{R}^m$, and replace $U$ by that open subset; if we can show that the set of critical values of the extended map has measure zero, then the same is true of the set of critical values of $F$.”

Page 129, displayed equation near the bottom of the page: Change “$i^th$ partial derivatives” to “$i^th$-order partial derivatives.”

Page 130, just below equation (6.2): Right after the displayed equation, insert “(where the component functions $F^2, \ldots, F^n$ might be different from the ones in the original coordinate chart).”

Page 131, two lines below the first displayed equation: Change $A'(R/K)^{k+1}$ to $A'(R/\sqrt{m}/K)^{k+1}$.

Page 131, three lines below the first displayed equation: Insert “at most” before “$K^m$ balls.”

Page 131, second displayed equation: Change the left-hand side to $K^m(A')^{n}(R/\sqrt{m}/K)^{n(k+1)}$, and in the next line, change the definition of $A''$ to $A'' = (A')^{n}(R/\sqrt{m})^{n(k+1)}$.

Page 132, proof of Lemma 6.13, second paragraph: This argument does not apply when $\partial M \neq \emptyset$, because in that case $M \times M$ is not a smooth manifold with boundary. Instead, we can consider the restrictions of $\kappa$ to $(M \times \text{Int } M) \sim \Delta_M$ and to $(M \times \partial M) \sim \Delta_M$ (both of which are smooth manifolds with boundary), and note that there is a point $[v] \in \mathbb{P}^{N-1}$ that is not in the image of $\tau$ or either of these restrictions of $\kappa$. [Thanks to David Iglesias Ponte for suggesting this correction.]
(10/25/21) **Page 134, proof of Theorem 6.15, just after the fourth paragraph of the proof:** Insert the following: “In case $M$ is an arbitrary compact subset of a larger manifold $M$ with or without boundary, we can adapt this argument to obtain an embedding of a neighborhood of $M$ into $\mathbb{R}^{nm+m}$. After covering $M$ with finitely many regular coordinate balls or half-balls for $M$, the argument above produces an injective immersion $F: \bigcup B_i \to \mathbb{R}^{nm+m}$, which is an embedding because its domain is compact; the restriction of this map to the union of the sets $B_i$ is the desired embedding.” [This is needed in the ensuing argument for the noncompact case, because the sets $E_i$ might not be regular domains when $\partial M \neq \emptyset$.]

(7/3/15) **Page 134, displayed equations two-thirds of the way down the page:** In the definition of $E_i$, there’s an “$i - i$” that should be “$i - 1$.” It should read $E_i = f^{-1}(\{b_{i-1}, a_{i+1}\})$.

(10/24/21) **Page 134, just below the displayed equations two-thirds of the way down the page:** Delete the sentence “By Proposition 5.47, each $E_i$ is a compact regular domain.” Two lines below that, replace “smooth embedding of $E_i$” with “smooth embedding of a neighborhood of $E_i$.”

(7/2/18) **Page 137, first paragraph under the subheading “Tubular Neighborhoods,” fifth line:** Change $R^n$ to $\mathbb{R}^n$.

(7/27/18) **Page 138, proof of Theorem 6.23, end of the first paragraph:** Change “standard coordinate frame” to “standard coordinate basis.”

(11/25/12) **Page 145, statement of Corollary 6.33:** After “immersed submanifold,” insert “with $\dim S = \dim M$.”

(12/5/16) **Page 145, paragraph above Prop. 6.34:** In the definition of smooth family of maps, replace “$F: M \times S \to N$” by “$F: N \times S \to M$.”

(9/28/19) **Page 146, equation (6.9):** Should read $dF(T_{(p,y)}W) \subseteq T_qX$. [Change the equal sign to subset.]

(9/28/19) **Page 146, line below the last displayed equation:** Change “= $T_qX$” to “$\subseteq T_qX$.”

(11/25/12) **Page 148, Problem 6-13:** Delete part (c). [This statement is simply wrong. It is true with the added hypothesis that $F'$ is an embedding, but then it’s essentially just a restatement of part (b).]

(2/10/18) **Page 150, last line:** Change “Theorem 20.16” to “Theorem 20.22.”

(12/30/17) **Page 160, first line:** Change $R_{hh^{-1}}$ to $R_{h^{-1}h}$. 

(2/16/18) **Page 164, just above the subheading:** Replace the last line of the proof of Prop. 7.23 by “The action is smooth because each $\varphi$ can be written locally as a composition of a smooth local section followed by $\pi$.”

(8/26/14) **Page 169, first line:** Change $\tilde{G}$ to $G$.

(6/21/20) **Page 169, statement of Theorem 7.35:** Replace the phrase “closed Lie subgroups such that $N$ is normal” by “Lie subgroups such that $N$ is normal and closed.” [In fact, using the result of Theorem 19.25 later in the book, the hypothesis that $N$ is closed can also be omitted.]

(3/18/19) **Page 171, third line from the end of the proof:** Change $E_i$ to $E_j$, so the formula reads $\rho_j^{(g)} = \pi^j(g \cdot E_j)$.

(9/17/14) **Page 173, Problem 7-21:** Replace the first sentence by “Prove that the groups in Problem 7-20 are isomorphic to direct products of the indicated groups in cases (a) and (c) if and only if $n$ is odd, and in cases (b) and (d) if and only if $n = 1$.”

(1/18/21) **Page 178, Example 8.10(d):** Change “Example 8.4” to “Example 8.5.”

(6/9/19) **Page 184, Example 8.20, next-to-last line:** Change $p = (u, v)$ to $q = (u, v)$.

(3/19/21) **Page 184, proof of Proposition 8.22:** After “Proposition 5.37,” insert “in the case $\partial S = \emptyset$. When $S$ has nonempty boundary, the proof of Proposition 5.37 still goes through using boundary slice coordinates for $S$. 


Page 196, proof of Proposition 8.45, next-to-last line: Should read “\( F_* \circ (F^{-1})_* = (F \circ F^{-1})_* = \text{Id}_{\text{Lie}(H)} \) and \( (F^{-1})_* \circ F_* = \text{Id}_{\text{Lie}(G)} \).”

Page 208, first line: Change to “This is just the existence and smoothness statements of Theorem D.1 . . . .”

Page 213, first sentence of the last paragraph: The definition of \( t_0 \) should be \( t_0 = \sup \{ t \in \mathbb{R} : (t, p_0) \in \mathcal{W} \} \).

Page 214, Fig. 9.6: The shaded area should be labeled \( W \), not \( \mathcal{D} \).

Page 217, Fig. 9.7: Both occurrences of \( \psi \) should be \( \Phi \).

Page 219, line 2: Here and in the rest of the paragraph, change \( p_0 \) to \( p_1 \) (seven times) to avoid confusion with the prior unrelated use of \( p_0 \) in this proof.

Page 222, just below the section heading: Insert the following sentence: “On a manifold with boundary, the definitions of \( \text{flow domain} \), \( \text{flow} \), and \( \text{infinitesimal generator of a flow} \) are exactly the same as on a manifold without boundary.”

Page 230, line 1 and first displayed equation: Change \( \theta_t(x) \) to \( \theta_t(u) \) (twice).

Page 230, second paragraph: “from Case” should be “from Case 1.”
(2/26/18) Page 230, fourth paragraph, last line: Change \([X, Y]\) to \([V, W]\).

(9/8/18) Page 234, proof of Theorem 9.46, second paragraph: Replace the two parenthesized sentences by the following: “(To see this, just choose \(\varepsilon_1 > 0\) and \(U_1 \subseteq U\) such that \(\theta_1\) maps \((-\varepsilon_1, \varepsilon_1) \times U_1\) into \(U\), and then inductively choose \(\varepsilon_i\) and \(U_i\) such that \(\theta_i\) maps \((-\varepsilon_i, \varepsilon_i) \times U_i\) into \(U_{i-1}\). Taking \(\varepsilon = \min\{\varepsilon_i\}\) and \(Y = U_k\) does the trick.)”

(5/29/16) Page 241, Example 9.52:

(11/12/16) Page 245, Example 10.8, lines 6–8:

(11/4/21) Page 255, Example 10.8, line 5:

(6/29/15) Page 278, Example 11.13, third line: Change “every coordinate frame” to “every coordinate coframe.”

(6/11/19) Page 296, line 6 from the bottom: Change “closed forms” to “closed covector fields” (twice).
Page 402, lines 2–3: There should not be a paragraph break before “and.”

Page 403, just after the last displayed equation: Add “(In the \( \mathbb{H}^n \) case, apply Theorem C.26 to the interiors of \( D \) and \( E \) considered as subsets of \( \mathbb{R}^n \)).”

Page 409, line 2: Change \( \varphi_i \) to \( \varphi \).

Page 415, paragraph above Example 16.19: Change “interior charts and charts with corners” to “interior charts, boundary charts, and charts with corners.”

Page 416, line 3 from the bottom: Change “manifold with boundary” to “manifold with nonempty boundary.”

Page 424, second displayed equation: Change \( \iota^* \beta(X) \) to \( \iota^\ast_M \beta(X) \).

Page 426, three lines below the section heading: “cam” should be “can.”

Page 430, Proposition 16.38(c): This statement is wrong. Change it to “If \( F \) is smooth, then \( F^* \mu \) is a continuous density on \( M \); and if \( F \) is a local diffeomorphism, \( F^* \mu \) is smooth.”

Page 439, Problem 16-23: The formula for \( g \) should be
\[
g = \frac{dx^2 + dy^2}{(1 - x^2 - y^2)^2}.
\]

Page 444, two lines below equation (17.4): Change \( T_{(q,s)}M \) to \( T_{(q,s)}(M \times \mathbb{R}) \).

Page 447, Corollary 17.15: Change “every closed form is exact” to “every closed \( p \)-form is exact for \( p \geq 1 \).”

Page 450, proof of Theorem 17.21, line 5: Change \( H^1_{dR}(S^n) \) to \( H^1_{dR}(S^1) \).

Pages 455–456, Proof of Theorem 17.32: The proof given in the book is incorrect, because the \( V_i \)’s might not be connected, so Theorem 17.30 does not apply to them. Here’s a corrected proof.

**Lemma.** If \( M \) is a noncompact connected manifold, there is a countable, locally finite open cover \( \{V_j\}_{j=1}^\infty \) of \( M \) such that each \( V_j \) is connected and precompact, and for each \( j \), there exists \( k > j \) such that \( V_j \cap V_k \neq \emptyset \).

**Proof.** Let \( \{W_j\}_{j=1}^\infty \) be a countably infinite, locally finite cover of \( M \) by precompact, connected open sets (such a cover exists by Prop. 1.19 and Thm. 1.15). By successively deleting unneeded sets and renumbering, we can ensure that no \( W_j \) is contained in the union of the other \( W_i \)’s.

Let \( Y_1 = \bigcup_{i=2}^\infty W_i \). Because \( M \) is connected, each component of \( Y_1 \) meets \( W_1 \), and by local finiteness of \( \{W_j\} \), there are only finitely many such components. Such a component is precompact in \( M \) if and only if it is a union of finitely many \( W_j \)’s. Let \( V_1 \) be the union of \( W_1 \) together with all of the precompact components of \( Y_1 \), and let \( X_1 \) be the union of all \( W_j \)’s not contained in \( V_1 \). Then \( V_1 \) is connected and precompact, and \( X_1 \) has no precompact components. Proceeding by induction, suppose we have defined connected, precompact open sets \( V_1, \ldots, V_m \) whose union contains \( W_1 \cup \cdots \cup W_m \), and such that the union \( X_m \) of all the \( W_j \)’s not contained in \( V_1 \cup \cdots \cup V_m \) has no precompact components. Let \( j_m \) be the smallest index such that \( W_{j_m} \) is not contained in \( V_1 \cup \cdots \cup V_m \), and let \( Y_{m+1} \) be the union of all \( W_i \)’s other than \( W_{j_m} \) not contained in \( V_1 \cup \cdots \cup V_m \). Any
precompact component of $Y_{m+1}$ must meet $W_{jm}$, because otherwise, it would be a precompact component of $X_m$. Let $V_{m+1}$ be the union of $W_{jm}$ with all of the precompact components of $Y_{m+1}$. As before, $V_{m+1}$ is precompact and connected, and the union $X_{m+1}$ of the $W_j$'s not contained in $V_1 \cup \cdots \cup V_{m+1}$ has no precompact components. Then by construction, for each $j$, the set $X_j = \bigcup_{i \geq j} V_i$ has no precompact components. If some $V_j$ does not meet $V_k$ for any $k > j$, then $V_j$ itself is a precompact component of $X_{j-1}$, which is a contradiction. Thus for each $j$, there is some $k > j$ such that $V_j \cap V_k \neq \emptyset$.

**Proof of Theorem 17.32.** Choose an orientation on $M$. Let $\{V_j\}_{j=1}^\infty$ be an open cover of $M$ satisfying the conclusions of the preceding lemma. For each $j$, let $K(j)$ denote the least integer $k > j$ such that $V_j \cap V_k \neq \emptyset$, and let $\theta_j$ be an $n$-form compactly supported in $V_j \cap V_{K(j)}$ whose integral is 1. Let $\{\psi_j\}_{j=1}^\infty$ be a smooth partition of unity subordinate to $\{V_j\}_{j=1}^\infty$.

Now suppose $\omega$ is any $n$-form on $M$, and let $\omega_j = \psi_j \omega$ for each $j$. Let $c_1 = \int_{V_1} \omega_1$, so that $\omega_1 - c_1 \theta_1$ is compactly supported in $V_1$ and has zero integral. It follows from Theorem 17.30 that there exists $\eta_1 \in \Omega^{n-1}_c(V_1)$ such that $d\eta_1 = \omega_1 - c_1 \theta_1$. Suppose by induction that we have found $\eta_1, \ldots, \eta_m$ and constants $c_1, \ldots, c_m$ such that for each $j = 1, \ldots, m$, $\eta_j \in \Omega^{n-1}_c(V_j)$ and

$$d\eta_j = \left(\omega_j + \sum_{i : K(i) = j} c_i \theta_i\right) - c_j \theta_j,$$

(*)&

Let

$$c_{j+1} = \int_{V_{j+1}} \left(\omega_{j+1} + \sum_{i : K(i) = j+1} c_i \theta_i\right).$$

Then by Theorem 17.30, there exists $\eta_{j+1} \in \Omega^{n-1}_c(V_{j+1})$ satisfying the analog of (*)& with $j$ replaced by $j + 1$. Set $\eta = \sum_{j=1}^\infty \eta_j$, with each $\eta_j$ extended to be zero on $M \setminus V_j$. By local finiteness, this is a smooth $(n-1)$-form on $M$. It satisfies

$$d\eta = \omega + \sum_{j=1}^\infty \left(\sum_{i : K(i) = j} c_i \theta_i\right) - \sum_{j=1}^\infty c_j \theta_j.$$

Each term $c_i \theta_i$ appears exactly once in the first sum above, so the two sums cancel each other.

(7/27/16) **Page 457, line below the second displayed equation:** Change “Theorem 17.31” to “Theorem 17.30.”

(7/12/16) **Page 463, line above equation (17.15):** Insert missing space before “Similarly.”

(7/13/16) **Page 464, end of proof of Corollary 17.42:** Insert “Note that this construction produces a form $\sigma$ whose support is contained in $U \cap V$.” [This might be useful for solving Problem 18-6.]

(7/12/16) **Page 471, last paragraph:** Replace the sentence starting “The hardest part . . .” with “The hardest part is showing that the singular chain complex of $M$ can be replaced by a chain complex built out of simplices whose images lie in either $U$ or $V$, without changing the homology.”

(9/12/17) **Page 487, Problem 18-1, first line:** Change “an oriented smooth manifold” to “a smooth manifold.”

(8/8/18) **Page 489, Problem 18-7(b):** Add to the hint: “In order to use Lemma 17.27, you’ll need to prove the following fact: Every bounded convex open subset of $\mathbb{R}^n$ is diffeomorphic to $\mathbb{R}^n$. To prove this, let $U$ be such a subset, and without loss of generality assume $0 \in U$. First show that there exists a smooth nonnegative function $f \in C^\infty(U)$ such that $f(0) = 0$ and $f(x) \geq 1/d(x)$ away from a small neighborhood of 0, where $d(x)$ is the distance from $x$ to $\partial U$. Next, show that $g(x) = 1 + \int_0^1 t^{-1} f(tx) \, dt$ is a smooth positive exhaustion function on $U$ that is nondecreasing along each ray starting at 0. Finally, show that the map $F : U \to \mathbb{R}^n$ given by $F(x) = g(x)x$ is a bijective local diffeomorphism. Also, you may use the fact that the conclusion of the five lemma is still true even if the appropriate diagram commutes only up to sign.”
Replace the sentence starting “On the other hand” by this: “On the other hand, the left-hand side is just the ordinary $t$-derivative of a time-dependent tensor on a fixed vector space, and expanding in terms of a basis shows that it satisfies a similar product rule.”

Change “$V: J \times M$” to “$V: J \times M \rightarrow TM$”; and change $\psi$ to $\theta$.

Change $\mathbb{R}^{2n+1} \setminus \{0\}$ to $\mathbb{R}^{2n+2} \setminus \{0\}$.

Should read
$$T \cdot d\Theta = -2 \sum_{i=1}^{n+1} (x^i \, dx^i + y^i \, dy^i) = -d(|x|^2 + |y|^2).$$

The formula for $d(N;T)$ should be
$$d(N;T) = \sum_{i=1}^{n+1} (x^i \, dx^i + y^i \, dy^i).$$

(b) $T = \frac{\partial}{\partial \zeta}$;

Change all occurrences of $\theta$ in this paragraph to $\psi$, to avoid confusion with the use of $\theta$ for a contact form elsewhere in this section.

Insert the following phrase at the beginning of this statement: With the exception of the word “closed” in part (d).

Change $\mathbf{B}_{i\cdot0}$ to $\mathbf{B}_{i\cdot0}$.

Change both occurrences of $\mathbf{.s}/$ to $\mathbf{x}/$.

Add the hypothesis $n > 0$.

Add the hypothesis that $M$ is connected.

Insert “defined on intervals containing $t_0$."

Delete the words “is a homeomorphism that.” [Checking that it’s a homeomorphism requires the norm topology, which is not defined until later on that page.]

Change “basis map” to “basis isomorphism.”

After the phrase “Any two differentiable solutions to (D.3)–(D.4),” insert “defined on intervals containing $t_0$."

Change “by a matrix” to “by a certain matrix” (twice).

Delete the words “is a homeomorphism that.” [Checking that it’s a homeomorphism requires the norm topology, which is not defined until later on that page.]
(12/2/15) **Page 666, just below the fifth display**: After the sentence ending “by our choice of \( \delta \) and \( \varepsilon \),” insert “(If \( t < t_0 \), interchange \( t \) and \( t_0 \) in the second line above.)”

(1/18/21) **Page 664, statement of Theorem D.4**: After the phrase “any two differentiable solutions to (D.3)–(D.4),” insert “defined on intervals containing \( t_0 \).”

(1/18/21) **Page 668, paragraph below equation (D.10)**: In the fourth line of the paragraph, change \( W \) to \( W \).

(1/18/21) **Page 670, displayed inequality between (D.17) and (D.18)**: Change \( n \) to \( n^2 \).

(1/18/21) **Page 670, last line**: Change \( n \) to \( n^2 \) in the definition of \( B \).

(1/18/21) **Page 671, inequality (D.19)**: Change \( n \) to \( n^2 \) (twice).

(12/15/20) **Page 671, just below (D.19)**: Replace the sentence “Since the expression on the right can be made as small as desired by choosing \( h \) and \( \tilde{h} \) sufficiently small, this shows . . .” by the following: “Thus the expression on the left can be made as small as desired by choosing \( h \) and \( \tilde{h} \) sufficiently small. This shows . . .”

(6/11/19) **Page 692**: Under the entry for “Form,” delete the references to page 294 for “closed” and page 292 for “exact.”

(2/25/18) **Page 693**: The index entry for “Hatcher, Allen” is misspelled.