CORRECTIONS TO

Introduction to Riemannian Manifolds (Second Edition)

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(7/31/19) **Page ix, near the middle of the page:** "Preissmann" is misspelled.

(10/7/20) **Page 15, line 3:** After "*connected if and only if M is connected*," insert "(*when* $n > 1$)."

(7/29/19) **Page 20, Exercise 2.23:** Change "Exercise 2.21" to "Example 2.21."

(1/25/21) **Page 27, third-to-last displayed equation:** In the line below that equation, change α_{k+1} to α_{k+l}. [The numeral 1 should be a letter l.] Then in the second and third lines below the equation, change g^{kl} to g^{pq} twice [to avoid conflict with the notation (k,l) for the type of F].

(1/25/21) **Page 27, third line from the bottom:** Change g_{kl} to g_{pq}.

(4/10/19) **Page 41, line 4 from the bottom:** Change "inner products" to "scalar products."

(1/23/21) **Page 56, third line from the bottom:** Change "Chapter 1" to "Chapter 2."

(1/10/21) **Page 70, lines 4 & 5:** Replace the clause beginning "let μ be" with the following: "let μ be a right-invariant density on K (for example, the Riemannian density of some right-invariant metric on K)."

(11/1/19) **Page 71, first paragraph, last line:** Change $\operatorname{Ad}(\varphi)X$ to $\operatorname{Ad}(\varphi)X_0$.

(5/17/20) **Page 80, last line:** Change z to w (twice).

(1/10/21) **Page 81, Problem 3-9:** Add the hypothesis that G is connected.

(6/14/19) **Page 82, Problem 3-20:** Delete the word "isotropic"; it should just say "homogeneous and symmetric."

(5/3/20) **Page 82, Problem 3-21:** In the third line, change M to $\widetilde{M}$.

(7/8/20) **Page 87, last two lines:** The second occurrence of $\frac{\partial}{\partial x}$ in each line should be $\frac{\partial}{\partial y}$.

(11/7/19) **Page 97, second line:** After the last sentence of the proof, add the following: "It is then a straightforward computational exercise to show that the resulting connection satisfies conditions (i)–(iv)."

(4/22/19) **Page 100, first displayed equation:** Change the last expression on the right to $X(Yu) - (\nabla_X Y)u$.

(11/7/19) **Page 105, first paragraph under the section heading:** Delete the sentence beginning "As we did with geodesics ...."

(7/8/20) **Page 106, last line:** Change $\eta(t)$ to $\eta^0(t)$.

(7/5/20) **Page 109, Corollary 4.33, third and fourth lines:** Replace $T_{\gamma(t_0)}M$ and $T_{\gamma(t)}M$ by $T_{\gamma(a)}M$.

(6/27/19) **Page 113, Problem 4-11(b):** Replace "G is abelian" by "the identity component of G is abelian."

(1/23/21) **Page 119, just above the last display:** Change $V^i, W^j : I \to \mathbb{R}$ to $V^i, W^j : (t_0 - \varepsilon, t_0 + \varepsilon) \to \mathbb{R}$.

(8/26/20) **Page 132, proof of Proposition 5.23, fourth and fifth lines:** Change $d\varphi_p^{-1}$ to $(d\varphi_p)^{-1}$ (twice).

(11/23/20) **Page 147, Problem 5-8(c):** Change "geodesics of g" to "maximal geodesics of g."

(2/11/21) **Page 155, just below equation (6.1):** Change "admissible partition for V" to "admissible partition for Γ."

(8/26/20) **Page 160, line 4:** Change $\partial_i|p$ to $\partial_i|_p$.

(5/29/20) **Page 163, second paragraph, third line:** Delete the repeated word "metric."

(11/16/20) **Page 173, proof of Proposition 6.25, last line:** Change "no longer than" to "no shorter than" (twice).

(1/25/21) **Page 175, two lines aboe Theorem 6.31:** Change "it it" to "it is."

(1/25/21) **Page 177, line 7 from the bottom:** Change $B_\varepsilon(p)$ to $B_{\varepsilon_p}(p)$.

(2/27/21) **Page 179, second paragraph, first line:** Change NS to NP.

(10/19/19) **Page 199, Proof of Lemma 7.8, second paragraph, last sentence:** Replace the phrase "an inductive application of the theorem concerning smooth dependence of solutions to linear ODEs on initial conditions (Thm. 4.31)" by "an inductive application of Theorem A.42 to vector fields of the form $W_k|_{(x,v)} = \partial/\partial x^k - v^i \Gamma_{ki}^j(x)\partial/\partial v^j$ on $C_\varepsilon \times \mathbb{R}^n$."

(6/15/20) **Page 201, third line from the bottom:** Change "application of Theorem 4.31" to "application of Theorem A.42 as in the proof of Lemma 7.8."

(11/1/19) **Page 214, middle displayed equation:** The indices on the left-hand side should be jl (not jk).

(11/1/19) **Page 217, last line:** Change $\langle df, df\rangle_g^2$ to $\langle df, df\rangle_g$.

(11/1/19) **Page 218, proof of Theorem 7.30, last displayed equation:** In the first line of that display, the indices in the last two terms are wrong. The first line should read

$$\widetilde{R}_{ijkl} = e^{2f}\Big(R_{ijkl} - (f_{;il}g_{jk} + f_{;jk}g_{il} - f_{;ik}g_{jl} - f_{;jl}g_{ik})\dots$$

(2/1/19) **Page 218, proof of Theorem 7.30, last line:** The last formula in the proof should read $\widetilde{g}^{ij} = e^{-2f}g^{ij}$ (swap g and $\widetilde{g}$).

(2/9/21) **Page 223, Problem 7-6:** Replace $\pi_1^*S_2$ with $\pi_2^*S_2$ in the last displayed equation.

(6/9/19) **Page 226, middle of the page:** The reference [dC92] should be [O'N83].

(4/22/19) **Page 234, proof of Proposition 8.12, third-to-last line:** Change $\widetilde{D}_t\gamma$ and $D_t\gamma$ to $\widetilde{D}_t\gamma'$ and $D_t\gamma'$, respectively.

(1/23/21) **Page 245, statement of Proposition 8.21(a):** Change $\boldsymbol{\gamma(t_{0)}}$ to $\boldsymbol{\gamma(t_0)}$ [fixing the misplaced parenthesis].

(1/31/20) **Page 257, Problem 8-11:** Change "a smooth surface" to "an embedded smooth surface."

(8/7/20) **Page 262, Problem 8-33(a):** Change the problem statement to read as follows:
(a) Show that there is a unique fiber metric on $\Lambda^2(TM)$ that satisfies

$$\langle w \wedge x,\ y \wedge z\rangle = \langle w, y\rangle\langle x, z\rangle - \langle w, z\rangle\langle x, y\rangle$$

for all tangent vectors w, x, y, z at every point $q \in M$.

(2/1/19) **Page 304, statement of Theorem 10.28:** At the end of the statement, after "$I(V,V) > 0$," insert "unless $V \equiv 0$."

(7/8/20) **Page 305, line below equation (10.25):** Change M to $\mathbb{R}$.

(2/1/19) **Page 307, statement of Corollary 10.29(c):** At the end of the statement, after "for all sufficiently small nonzero s," insert "unless the variation field of Γ is identically zero."

(12/12/20) **Page 311, statement of Corollary 10.35:** Add the hypothesis that the manifold is nonempty.

(6/15/20) **Page 315, last displayed equation:** Replace that equation by the following:

$$J(a) \in T_{\gamma(a)}P \quad \text{and} \quad D_tJ(a) + W_{\gamma'(a)}(J(a)) \perp T_{\gamma(a)}P.$$

(12/5/20) **Page 317, Problem 10-23:** At the end of the first sentence, add the hypothesis "and $q \in \mathrm{Cut}(p)$."

(12/11/20) **Page 317, Problem 10-23(b):** Change "closed geodesic" to "unit-speed closed geodesic."

(7/31/19) **Page 345, third paragraph:** "Preissmann" is misspelled.

(10/27/19) **Page 350, near the middle of the page, in the statements of the Bieberbach theorems:** Change "Euclidean space form(s)" to "compact Euclidean space form(s)" (twice).

(7/31/19) **Page 357, subheading and first three paragraphs:** "Preissmann" is misspelled (four times).

(7/31/19) **Page 360, near the top and near the bottom:** "Preissmann" is misspelled (twice).

(3/12/18) **Page 415, reference [BBBMP]:** "Zürich" is misspelled.

(3/12/18) **Page 415, reference [Cha06]:** The phrase "A modern introduction" should be part of the title: *Riemannian Geometry: A Modern Introduction*.

(7/31/19) **Page 418, reference [Pre43]:** "Preissmann" is misspelled.

(7/31/19) **Page 433:** "Preissmann" is misspelled (twice).