Errata to Tom L. Lindstrøm: *Spaces. An Introduction to Real Analysis*

This list contains all reported misprints and errors (many thanks to Eirik Ergon Aung, Simon Foldvik, Marius Havgar, Bernt Ivar Nødland, Suman Sunderroy, Erlend Fornæss Wold, and (especially) Olav Skutlaberg). The ones that are most likely to cause confusion are listed in red, and comments on the corrections are in blue to distinguish them from the corrections themselves.

There is slight inconsistency in the notation for open balls: According to the definition on page 49, they are to be denoted by $\mathrm{B}(a; r)$, but in parts of the book this degenerates into $\mathrm{B}(a, r)$. I have not attempted to trace these inconsistencies.

Negative line numbers are counted from below, hence "page 41, line -9" means line number 9 from the bottom of page 41.

Where	Says	Should have said
page 12, line -6	the	then
page 15, line 16	$\subseteq f(\bigcup_{A\in\mathcal{A}})$	$\subseteq f(\bigcup_{A\in\mathcal{A}} A)$
page 16, line 6	$f^{-1}(B^c))$	$f^{-1}(B^c)$
page 20, line 5	$z \sim y$	$z \sim w$
page 22, line 11	$A_1 \times A_2 \times \ldots A_n$	$A_1 \times A_2 \times \ldots \times A_n$
page 25, line 14	$x_n = a..$	$x_n = a.$
page 29, line 13	$\min\{\delta_1, \delta_2.\}$	$\min\{\delta_1, \delta_2\}$
page 29, line -5	$\lvert \lVert\mathbf{a}\rvert - \lVert\mathbf{b}\rVert \rvert \leq \lVert\mathbf{a}-\mathbf{b}\rVert$	$\lvert \lVert\mathbf{a}\rVert - \lVert\mathbf{b}\rVert \rvert \leq \lVert\mathbf{a}-\mathbf{b}\rVert$
page 40, line -15	maximum	minimum
page 43, line 9	leads	lead
page 65, line 6	K	K
page 72, Definition 3.7.3	... is a metric space $(\overline{X}, d_{\overline{X}})$	... is a complete metric space $(\overline{X}, d_{\overline{X}})$
page 86, Figure 4.3.1, label on y-axis	n	n
page 87, line -13	$, leq$	$\lvert \leq$
page 99, line -8	$C(X, Y)$	$B(X, Y)$
page 100, line 18	Y	Y
page 105, line 13	$\mathbf{y}_0 + \int_0^t \mathbf{f}(t, \mathbf{z}(t))\, dt$	$\mathbf{y}_0 + \int_0^t \mathbf{f}(s, \mathbf{z}(s))\, ds$
page 110, line -6	...get at function ...	...get a function ...
page 115, line -19	$\lVert \int_0^t \ldots \rVert$	$\lVert \int_0^t \ldots\, ds \rVert$
page 118, line -9 (to ensure strict inequality in line -2)	$E(\ldots) \leq E(\ldots) \leq \frac{\epsilon}{2}$	$E(\ldots) < E(\ldots) \leq \frac{\epsilon}{2}$
page 120, line 12	$\ldots > \frac{c_n}{\sqrt{n}}..$	$\ldots > \frac{c_n}{\sqrt{n}}.$
page 127, line 7 (spacing)	$\ldots g_x(y) < f(y) + \epsilon$	$\ldots g_x(y) < f(y) + \epsilon$
page 138, line -7 and -9	x	$\mathbf{x}$
page 139, line -6	$x_1\mathbf{e}_1 + x_2\mathbf{e}_2 + \ldots x_n\mathbf{e}_n$	$x_1\mathbf{e}_1 + x_2\mathbf{e}_2 + \ldots + x_n\mathbf{e}_n$
page 141, line -7	Example 3	Example 1
page 144, Figure 5.3.3	$\mathbf{u} - \mathbf{p}$	the drawing lacks an arrow (vector)
page 150, line 15	$\sum_{n=1}^N x_n y_n = \ldots$	$\sum_{n=1}^N \lvert x_n y_n \rvert = \ldots$
page 152, line -13	...exist a $\mathbf{u_n}$ such ...	...exist a $\mathbf{u}_n$ such ...
page 155, line 14	ker A	ker(A)
page 155, line -21	**Teorem**	**Theorem**

Where	Says	Should have said
page 153, line -7	$\leq \sup \left\{ \frac{\Vert(A(\mathbf{u})\Vert + \ldots}{\Vert\mathbf{u}\Vert_V} \right.$	$\leq \sup \left\{ \frac{\Vert A(\mathbf{u})\Vert_W + \ldots}{\Vert\mathbf{u}\Vert_V} \right.$
page 157, line -13	$\Vert f\Vert = 1$	$\Vert f\Vert \leq 1$ (to include $n = 1$)
page 160, line 13:	$g\colon [a,b] \to [a,b]$	$g\colon [a,b] \to \mathbb{R}$
page 160, line -4	there is a $c \in \mathbb{R}$	there is a positive $c \in \mathbb{R}$
page 163, line 11	$\overline{B}(0, \mathbf{n}))$	$\overline{B}(0, \mathbf{n})$
page 171, line -	due to due to Banach	due to Banach
page 180, line 5 When the spaces X, Y are complex, we have to let t go to 0 as a complex variable.		
page 180, line 8	X is a normed space	X, Y are normed spaces
page 180, line 12	$t\mathbf{r} \in O$	$\mathbf{a} + t\mathbf{r} \in O$
page 181, line 2	$\mathbf{F}(\mathbf{a})'(1)$	$\mathbf{F}'(\mathbf{a})(1)$
page 182, line 17	exists	exist
page 191, line -8	normed space	complete normed space
page 190, line 14	$\leq \frac{\epsilon}{3}\mathbf{r}$	$\leq \frac{\epsilon}{3}\Vert\mathbf{r}\Vert$
page 191, lines 8, -12, -7, -1	$\lvert R(\ldots) - R(\ldots)\rvert$	$\Vert R(\ldots) - R(\ldots)\Vert$
page 192, line 1 (twice)	$\lvert R(\ldots) - R(\ldots)\rvert$	$\Vert R(\ldots) - R(\ldots)\Vert$
page 195, line 7	$\mathbf{X} = \mathbb{R}^d$	$X = \mathbb{R}^d$
page 195, line 19	$F^{(k)}$	$\mathbf{F}^{(k)}$
page 196, line -3	$H(t) = \int_0^t \frac{1}{n!}(1-t)^n \mathbf{F}^{(n+1)}(t)\,dt$	$H(t) = \int_0^t \frac{1}{n!}(1-s)^n \mathbf{F}^{(n+1)}(s)\,ds$
page 199, Example 1. Here I must have forgotten to divide the terms by $\lvert\alpha\rvert!$. This doesn't change the first order terms, but the second order terms have to be divided by $2! = 2$ and the third order terms by $3! = 6$.	$f(\mathbf{a}) + \frac{\partial f}{\partial x_1}(\mathbf{a})h_1 + \frac{\partial f}{\partial x_2}(\mathbf{a})h_2$ $+\frac{\partial^2 f}{\partial x_1}(\mathbf{a})h_1^2 + 2\frac{\partial^2 f}{\partial x_1 \partial x_2}(\mathbf{a})h_1h_2$ $+\frac{\partial^2 f}{\partial^2 x_2}(\mathbf{a})h_2^2 + \frac{\partial f^3}{\partial x_1^3}(\mathbf{a})h_1^3$ $+3\frac{\partial f^3}{\partial x_1^2 \partial x_2}(\mathbf{a})h_1^2h_2 +$ $+3\frac{\partial f^3}{\partial x_1 \partial x_2^2}(\mathbf{a})h_1h_2^2 + \frac{\partial^3 f}{\partial x_2^3}(\mathbf{a})h_2^3$	$f(\mathbf{a}) + \frac{\partial f}{\partial x_1}(\mathbf{a})h_1 + \frac{\partial f}{\partial x_2}(\mathbf{a})h_2$ $+\frac{1}{2}\frac{\partial^2 f}{\partial x_1}(\mathbf{a})h_1^2 + \frac{\partial^2 f}{\partial x_1 \partial x_2}(\mathbf{a})h_1h_2$ $+\frac{1}{2}\frac{\partial^2 f}{\partial^2 x_2}(\mathbf{a})h_2^2 + \frac{1}{6}\frac{\partial f^3}{\partial x_1^3}(\mathbf{a})h_1^3$ $+\frac{1}{2}\frac{\partial f^3}{\partial x_1^2 \partial x_2}(\mathbf{a})h_1^2h_2 +$ $+\frac{1}{2}\frac{\partial f^3}{\partial x_1 \partial x_2^2}(\mathbf{a})h_1h_2^2 + \frac{1}{6}\frac{\partial^3 f}{\partial x_2^3}(\mathbf{a})h_2^3$
page 200, line 1	$\ldots$ with $\lvert\alpha\rvert = k + 1$	$\ldots$ with $\lvert\alpha\rvert = n + 1$
page 200, line 2	$\lvert f(\mathbf{a} + \mathbf{a}) - \ldots\rvert$	$\lvert f(\mathbf{a} + \mathbf{h}) - \ldots\rvert$
page 205, line 9	$\frac{\partial \mathbf{F_i}}{\partial x_j}$	$\frac{\partial \mathbf{F}_i}{\partial x_j}$
page 205, lines -9, -10	x	$\mathbf{x}$
page 206, line 14	$g'(y_0) = \frac{1}{f(x_0)}$	$g'(y_0) = \frac{1}{f'(x_0)}$
page 207, line -5	$\mathbf{x}_1 - \mathbf{x}_2 = \mathbf{H}(\mathbf{x}_1) - \mathbf{H}(\mathbf{x}_2)$	$\mathbf{x}_1 - \mathbf{x}_2 = \mathbf{H}(\mathbf{x}_2) - \mathbf{H}(\mathbf{x}_1)$
page 209-210, proof of the Inverse Function Theorem		At the end of the proof one should check that $\mathbf{G}$ really is local inverse of $\mathbf{F}$. This can be left to the reader, but the need for a proof should perhaps be pointed out.
page 210, line 20	A is $\mathbf{F}'(\bar{\mathbf{a}})$	A is $\mathbf{F}'(\mathbf{a})$
page 212, line -13	$\mathbf{G}(x)$	$\mathbf{G}(\mathbf{x})$ (two places)
page 212, line -7	$\mathbf{H}'(\mathbf{a})$	$\mathbf{H}'(\mathbf{a}, \mathbf{b})$
page 213, line -15	$\mathbf{X} \times \mathbf{Y}$	$X \times Y$
page 215, line 7	Corollary 6.8.3	Corollary 6.8.2.
page 224, line -13	$\mathbf{y}_x$	$\mathbf{y}_{\mathbf{x}}$
page 225, line 2	$= \mathbf{y}_2(t)$	$= \mathbf{y}_2(t_0)$
page 226, line 10	$A\colon X_1 \times X_2 \times \ldots X_n \to Y$	$A\colon X_1 \times X_2 \times \ldots \times X_n \to Y$
page 226, line -2	$X_1, X_2, \ldots X_n$	$X_1, X_2, \ldots, X_n$
page 227, lines 7, 13, 14, -10	$X_1 \times X_2 \times \ldots X_n$	$X_1 \times X_2 \times \ldots \times X_n$

Where	Says	Should have said
page 228, line 9	$\dots \|\mathbf{x}-\mathbf{a}_2\|$	$\dots \|\mathbf{x}-\mathbf{a}_n\|$
page 229, lines -10 and -5	$A(\mathbf{F}_1(\mathbf{a}), \mathbf{F}_2(\mathbf{a}), \dots$ $\dots, \mathbf{F}'_{n-1}(\mathbf{a})(\mathbf{r}), \mathbf{F}_{n-1}(\mathbf{a}))$	$A(\mathbf{F}_1(\mathbf{a}), \mathbf{F}_2(\mathbf{a}), \dots$ $\dots, \mathbf{F}'_{n-1}(\mathbf{a})(\mathbf{r}), \mathbf{F}_{n}(\mathbf{a}))$
page 229, line -8	$\mathbf{K}(\mathbf{x}) = (\mathbf{F}_1(\mathbf{x}), \mathbf{F}_2(\mathbf{x})), \dots, \mathbf{F}_n(\mathbf{x}))$	$\mathbf{K}(\mathbf{x}) = (\mathbf{F}_1(\mathbf{x}), \mathbf{F}_2(\mathbf{x}), \dots, \mathbf{F}_n(\mathbf{x}))$
page 231, line 17	derivates	derivatives
page 231, line 18	derivate	derivative
page 232, line 3	$\mathbf{X}^n$	X^n
page 232, line 18	$\mathcal{L}(X \to \mathcal{L}(X, \dots, \mathcal{L}(X, Y) \dots)$	$\mathcal{L}(X, \mathcal{L}(X, \dots, \mathcal{L}(X, Y) \dots))$
page 233-235, proof of Theorem 6.11.3. The order of $(\mathbf{r})$ and $(\mathbf{s})$ has become mixed up several times here. The problem is that I say (p. 233, l. -8) that I shall prove something for $\mathbf{F}''(\mathbf{a})(\mathbf{r})(\mathbf{s})$ and then prove it for $\mathbf{F}''(\mathbf{a})(\mathbf{s})(\mathbf{r})$ instead. The next three corrections sort things out.		
page 233, line -8	$\mathbf{F}''(\mathbf{a})(\mathbf{r})(\mathbf{s})$	$\mathbf{F}''(\mathbf{a})(\mathbf{s})(\mathbf{r})$
page 233, line -7	$\mathbf{F}''(\mathbf{a})(\mathbf{s})(\mathbf{r})$	$\mathbf{F}''(\mathbf{a})(\mathbf{r})(\mathbf{s})$
page 235, line 7	$\mathbf{F}''(\mathbf{a})(\mathbf{r})(\mathbf{s})$	$\mathbf{F}''(\mathbf{a})(\mathbf{s})(\mathbf{r})$
page 242, line 1	$A_1, A_2, A_3 \dots$	$A_1, A_2, A_3, \dots$
page 242, line 3	$\mu(\bigcup_{n=1}^\infty A_N) =$	$\mu(\bigcup_{n=1}^\infty A_n) =$
page 245, line -5	for n > 1	for $n > 1$
page 245, line -4	for all N	for all n
page 250, line -19	This an instance	This is an instance
page 253, line -11	$\left(f^{-1}([-\infty, s))\right)^c$	$\left(f^{-1}([-\infty, s))\right)^c$
page 253, line -9	$\left(f^{-1}([-\infty, s])\right)^c$	$\left(f^{-1}([-\infty, s])\right)^c$
page 255, line 4	$\{x \in X \mid (f+g) < r\}$	$\{x \in X \mid (f+g)(x) < r\}$
page 255, line 5	$\{x \in X \mid g < r - q\}$	$\{x \in X \mid g(x) < r - q\}$
page 257, line 8	almost everywhere	on a null set **Comment:** The text only defines equality a.e. for measurable functions which doesn't make sense in part b).
page 260, line -10	step function	simple function
page 261, line 2	$\int f\, du =$	$\int f\, d\mu =$
page 261, line -10	$\int_{A_n} a\, du = am$	$\int_{A_n} a\, du \geq am$
page 261, line -2	$g(x) = \sum_{i=1}^m b_i \mathbf{1}_{B_1}$	$g(x) = \sum_{i=1}^m b_i \mathbf{1}_{B_i}$
page 266, line -11	$g_k(x) = \inf_{k \geq n} f_n(x)$	$g_k(x) = \inf_{n \geq k} f_n(x)$
page 268, line -7	$\lim_{n\to\infty} \phi_{\mathcal{P}_n} = \lim_{n\to\infty} \Phi_{\mathcal{P}_n}$ a.e.	$\lim_{n\to\infty} \phi_{\mathcal{P}_n} = \lim_{n\to\infty} \Phi_{\mathcal{P}_n}$ a.e. (see e.g. Exercise 4b)
page 268, line -4	a.s.	a.e. (**Comment:** a.s. is short for *almost surely* and is an alternative expression for a.e. that hasn't been introduced in the text).
page 274, line -2	for each $x \in X$	for each $x \in \mathbb{R}$
page 278, line 8	with inequality	with equality
page 279, line 2	$\frac{\|f(x)^p\|}{\|f\|_p^p}$	$\frac{\|f(x)\|^p}{\|f\|_p^p}$
page 281, line -10	$= \lim_{N\to\infty} \|\sum_{n=1}^N \mathbf{u}_n\|_p \leq \dots$	$= \lim_{N\to\infty} \|\sum_{n=1}^N \|\mathbf{u}_n\|\,\|_p \leq \dots$

Where	Says	Should have said
page 283, line 11	$p, q \in [0, \infty]$	$p, q \in [1, \infty]$
page 287, line 2	pointwise to f on A_K	pointwise to f on A_K^c
page 287, line 8	$p \in [0, \infty)$	$p \in [1, \infty)$
page 292, line -8	subsets of $\mathbb{R}^d$	subsets of X
page 295, line 12	$A \subseteq \mathbb{R}^d$	$A \subseteq X$
page 296, line 13	$A \in \mathcal{A}$	$A \subseteq X$
page 299, line 11		**Added explanation:** In the first inequality we are using that a premeasure ρ on an algebra is increasing; i.e. $\rho(A) \leq \rho(B)$ when $A \subseteq B$.
page 299, line -7	$C_n \setminus (C_1 \cup \ldots C_{n-1})$	$C_n \setminus (C_1 \cup \ldots \cup C_{n-1})$
page 300, line 9	R^c is a a disjoint union	R^c is a finite, disjoint union
page 301, line -13	$\sum_{i=1}^{n} \lambda(R_i) = \ldots$	$\sum_{i=1}^{\infty} \lambda(R_i) = \ldots$
page 302, line 5	$A = \cup_{j=i}^{M} R_j$	$A = \cup_{j=1}^{M} R_j$
page 310, line 10	g is continuous	g is continuous
page 329, line -13	$\ldots - \frac{1}{2\pi} \left[\frac{e^{-inx}}{n^2} \right]_{-\pi}^{\pi} = \ldots$	$\ldots + \frac{1}{2\pi} \left[\frac{e^{-inx}}{n^2} \right]_{-\pi}^{\pi} = \ldots$
page 334, line -16	$(C_p, \\| \cdot \\|)$	$(C_P, \\| \cdot \\|)$
page 340, line-2	$D_n(t) = \frac{\sin((n+\frac{1}{2})t)}{\sin \frac{t}{2}}$ To ...	$D_n(t) = \frac{\sin((n+\frac{1}{2})t)}{\sin \frac{t}{2}}$. To ...
page 346, line 13	$<$	$\leq$ (first inequality)
page 346, line 18	C_p	C_P
page 357, line -13	C_p	C_P