The Cauchy–Schwarz Master Class
Errata as of May 2008.

I plan to up-date this collection periodically, and, of course, these corrections will be incorporated into the second printing. Also, don't forget to check out the link to the remarkable list compiled by Byron Schmuland. The typos found by Allen Stenger have now been incorporated in the this page-by-page listing.

If you find an error (or even a cosmetic goof), please do let me know.

Thanks, Mike Steele

Errata

Page x line 12: Kirin $\longrightarrow$ Kiran
Page 11: "quadratic formula" should replace "binomial formula"
Page 15: In the first line of Exercise 1.11 both v and w should be in bold face.
Page 22, line 22: "n goes to infinity" should be "t goes to infinity"
Page 32, Exercise 2.5: The inequality should have been written as

$$n(xy)^{(n-1)/2} \leq \frac{x^n - y^n}{x - y}$$

in which case it holds for all n. For the "simplified" form given in the text, one would need $x > y$ or else there would be a reversal of the stated inequality.
Page 33: Display (2.28) xyx should be xyz
Page 34, two lines below (2.30): "follow" should be "follows".
Page 35, second line of Exercise 2.12: For improved usage remove the word "both."
Page 35, in the line after (2.33): "two the" should be "the two."
Page 36, Figure 2.5: In the last line of the text to the right of the diagram, π should be $\pi/2$.
Page 47 line -3: $(a\alpha + D\beta)^2 \longrightarrow (a\alpha + Db\beta)^2$
Page 48 line 12:

$$\left\{ \sum_{j=1}^{n} a_j b_j + 2x \sum_{1 \leq j < k \leq n} a_j b_k \right\}^2 \quad \text{should be} \quad \left\{ \sum_{j=1}^{n} a_j b_j + x \sum_{1 \leq j < k \leq n} (a_j b_k + a_k b_j) \right\}^2$$

Page 49 line 10:

$$\sum_{j=1}^{n} a_j b_j \sum_{j=1}^{n} s_j t_j \quad \text{should be} \quad \sum_{j=1}^{n} a_j t_j \sum_{j=1}^{n} b_j s_j$$

Page 55 line 5: $u_1 v_2$ should read $u_1 v_1$
Page 59 line 2: $\mathbf{v} - t\mathbf{v}$ should read $\mathbf{v} - t\mathbf{x}$
Pages 71 Line -2 (Exercise 4.12) $|\langle \mathbf{x}, \mathbf{x} \rangle \langle \mathbf{y}, \mathbf{z} \rangle - \langle \mathbf{x}, \mathbf{y} \rangle \langle \mathbf{x}, \mathbf{z} \rangle |2$ should read $|\langle \mathbf{x}, \mathbf{x} \rangle \langle \mathbf{y}, \mathbf{z} \rangle - \langle \mathbf{x}, \mathbf{y} \rangle \langle \mathbf{x}, \mathbf{z} \rangle |^2$. A similar correction is needed on page 242 in the Solution of Exercise 4.12.

Page 75 line -2: "we find the' $\longrightarrow$ "we find that"

Page 78 line 1: "left-hand sum" not "right-hand sum"

Page 83 line -7: "sometimes saves" $\longrightarrow$ "sometimes save"

Page 83 (Exercise 5.4): "$\cdots + z^\alpha(z-x)(x-y) \geq 0$" should read "$\cdots + z^\alpha(z-x)(z-y) \geq 0$" and "$x = y = x$" should read "$x = y = z$."

Page 93, displayed equation (6.14), the term to the right of the inequality sign should be "$4\sqrt{3}A$" rather than "$4A/\sqrt{3}$."

Page 94 line -8, "know" should be "known."

Pages 96–99: Li Zhou has pointed out a big gap in this discussion. As the text states, the bound (6.18) needs to be proved for all real x, y, z such that $\exp(x, y, z) \geq 2^9$, but my argument only does this for nonnegative x, y, z. I hope to find a cheap way to fix this gap, or in the next edition the convex minorant trick will be illustrated with a different example. Li Zhou has provided a nice alternative.

Pages 101/249–250, Exercise 6.8: Robin Chapman points out that the solution asserts that $L(x, y, z)$ is convex in all variables, but

$$\frac{\partial^2}{\partial z^2} L(x, y, z) = \frac{2y^2}{(1+z)^3} + \frac{2}{1+x+y} - 2x^2(1 - y^2)$$

and so

$$\frac{\partial^2}{\partial z^2} L(1, 0, z) = -1.$$

Thus, $L(x, y, z)$ is not convex in z. This remains on my "to fix list" which I expect to get to in early 2007.

Pages 103 and 252 regarding Exercise 6.14: Chapman also notes that the solution offered does not address the question as stated but rather its analogue with $r = 1$. The easy fix here is just to restrict the problem to the case of $r = 1$. Still, I suspect that the problem is correct as posed but one needs to do a scaling. This is also on my "to fix" list.

Page 110 line 8: "$\sqrt{x}|f(x)| \to \infty$" should be "$\sqrt{x}|f(x)| \to 0$."

Page 111 line 8: the first integral should be from x to $x+h$ not 0 to h as written. Also, $f(x)$ should be replaced by $|f(x)|$ on lines 7,10, 12, and 13.

Page 116, Each time d^4/dx^4 is written d^4/dt^4 was intended.

Page 139, line -5: $a_k^{p/(p-1)}$ should be $a_k^{1/(p-1)}$

Page 148, line -1: "$\sum_{n=0}$" should be "$\sum_{j=0}$"

Page 159 line 19: "lower bound on c" should read "lower bound on C"

Page 160 last display: $x^{-\frac{1}{2}+\epsilon}$ should be $x^{-\frac{1}{2}-\epsilon}$

Page 179, line -3: E_1 should be E_0.

Page 181, line -1: $1 < j < n$ should be $1 \leq j < n$.

Page 188 bottom: The inequality should either have absolute values on both sides, or the polynomial should be $x^n - a_1 x^{n-1} + a_2 x^{n-2} + \cdots$, so that the coefficients are guaranteed to be positive. [Note: This is a reader comment that I have not yet checked.]

Page 191 line 11: any pair of *nonnegative* real ...

Page 197 line 3: $1 + c_j$ should be $1 - c_j$.

Page 204 line -5. In the second inequality of Exercise 13.1, the left-hand side should read $(2/(z+y))^5 + (6/(3x+y+2z))^5 + (6/(3x+2y+z))^5$.

Page 204, In Exercise 13.1, the last parenthetical term of the first inequality should be $x/6 + 5z/6$ rather than $x/6 + 5y/6$.

Page 205 line 6: "Szeméredi's" should be "Szemerédi"

Page 205: The last words of last line should read "Schur concave."

Page 217 Solution for Exercise 1.3, on page 227. Here $\hat{c}_k$ should be taken to be $|c_k|(c_1^2 + c_2^2 + \cdots + c_n^2)^{-1}$.

Page 226 line 13: Should read Stillwell (1998, p. 216) not page 116. Moreover, the reference is to John Stillwell, *Numbers and Geometry*, Springer, 1998 which was unfortunately omitted from the bibliography. SORRY!

Page 228 line 8: $3y_2^2$ should be $3x_2y_2$

Page 228, last line of solution for Exercise 1.7: "useful **version** of."

Page 227, solution to Exercise 1.3: $\hat{c}_k^2 =$

Page 230, solution for Exercise 1.12: In line 3, x_j should be v_j, and y_j should be w_j.

Page 232, solution for Exercise 2.1: In line 5 the rightmost S' should be S''

Page 232, solution for Exercise 2.2: In all three places "(2.23)" should be "(2.24)". And in line 3, x^2 should be nx^2 .

Page 232, solution for Exercise 2.3: In line 3, "(2.7)" should be "(2.9)"

Page 232 line -2. The first inequality should be strict.

Page 232 line -1: $a^2bc = (a^3)^{2/3}(b^3)^{1/3}(c^3)^{1/3} \le 2a^3/3 + b^3/3 + c^3/3 \longrightarrow$
$$a^2bc = (a^4)^{1/2}(b^4)^{1/4}(c^4)^{1/4} \le a^4/2 + b^4/4 + c^4/4$$

Page 233, solution for Exercise 2.5: In the displayed equation $x^{n-1}y$ should be $x^{n-2}y$.

Page 233 solution for Exercise 2.6: $\alpha + \beta = \pi/2$ (not π)

Page 233, solution for Exercise 2.7: In the first displayed equation xyz should be $(xyz)^{1/3}$.

Page 233, line 12: $\alpha + \beta = \pi$ should be $\alpha + \beta = \pi/2$

Page 234, solution for Exercise 2.10: In line 1 $y = x - 1$ should be $x = y - 1$, and in line 5 "algebra" would be more appropriate than "arithmetic."

Page 235, line 1: For compatibility, I should change ρ_0 and ρ_1 on page 35, to ρ_- and ρ_+. By the time I got to the solution, the latter seemed more memorable.

Page 235, lines 2-3: For compatibility page with page 35, it would be better to take the intervals to be $[0, 1]$ and $(1, \infty)$.

Page 238 line 5:

$$\left\{ \sum_{j=1}^{n} a_j^2 \sum_{k=1}^{n} b_k^2 - \sum_{j=1}^{n} a_j b_j \right\}^2 \quad \text{should be} \quad \left\{ \sum_{j=1}^{n} a_j^2 \sum_{k=1}^{n} b_k^2 - \left(\sum_{j=1}^{n} a_j b_j \right)^2 \right\}.$$

Page 252 line 9: Problem E10940 should be Problem 10940. This is correct in the References.

Page 253 line 14: $- - 2 \longrightarrow -2$

Page 254, line -4) d^4/dx^4 should be d^4/dt^4. Note: the October 10, 2006 errata noted this error for the statement of Exercise 7.5 on p. 116, but failed to note that the same error that occurs in the solution.

Page 255, last line: $\log t$ should be $\log(1+t)$ in both occurrences.

Page 256, first inequality: $\log x$ should be $\log(1+x)$.

Page 257, line -5. The title "The Continuum of Means" should be "The Ladder of Power Means."

Page 259, line -7. Maor (not "Naor") Page 271 line 13: (11.20) should be (11.19)

Page 280 line 8: Exercise 14.32 should be Exercise 14.3

Page 286: The note regarding Figure 4.1 should be changed to "The example of Figure 4.1 has a long oral tradition at Bell Labs where I first heard it. It is also used by Richard W. Hamming in his lovely book *The Art of Doing Science and Engineering: Learning to Learn* (1997, Chapter 9, figure 9.IV).

Page 298 line -11: (11.20) Olkin, I. and Marshall, A. should be Marshall, A. and Olkin, I.

Page 292–301. Due to some bizarre Latex mystery, some references are not in alphabetical order. Some that are out of place: Bradley, D; Cartan, H; Duncan, J.; Kaijser, J.; Knuth, D.; Lozansky, E.; Schur, I.; Sigillito, V.G..; Zukav, G.

- John Stillwell

- Allen Stenger

- Peter G. Strand

- Antonio Vera

- John Washburn

- William Wu

- Li Zhou

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