ERRATA
for
Principles of Fourier Analysis
( August 1, 2013)

Notes:
- text from the book is printed using this font (Times Roman)
- Comments are printed using this font (Univers Condensed)
- text to be added is underlined and in italics like this
- text to be deleted has been “struck out” like this
- ★ indicates a new addition to the list

(And, of course, beware of possible typos in this list of typos.)

ERRORS

Chapter 2 (Basic Terminology, Notation, and Conventions), page 8, displayed summation in the lower middle of the page: Replace \( \sin(n\pi x) \) with \( \sin(k\pi x) \).

Chapter 2 (Basic Terminology, Notation, and Conventions), page 11, line 6: rapid changes during a very brief periods.

Chapter 3 (Basic Analysis I: Continuity and Smoothness), page 21, line 18: by the ... chosen ...

Chapter 3 (Basic Analysis I: Continuity and Smoothness), page 25, 8th line after Higher Order Smoothness: Replace \( f^{(k-1)} \) with \( f^{(k-2)} \).

Chapter 3 (Basic Analysis I: Continuity and Smoothness), page 26, line 4 from bottom: Sketch the graphs of \( f(x) \) and \( f(x-\gamma) \) ...

Chapter 3 (Basic Analysis I: Continuity and Smoothness), page 27, 2nd line in paragraph 3: Replace \( (\alpha - \gamma, \beta - \gamma) \) with \( (\alpha + \gamma, \beta + \gamma) \).

Chapter 3 (Basic Analysis I: Continuity and Smoothness), page 28, first line: As long as \( \text{If} \).

Chapter 3 (Basic Analysis I: Continuity and Smoothness), page 30, line 5: Replace \( B \) with \( |B| \).

Chapter 3 (Basic Analysis I: Continuity and Smoothness), page 35, line 12:

Replace
\[
\left[ f(\delta_n) + \frac{1}{n} - f(\delta_n) - \frac{1}{n} \right]
\]

with
\[
\left[ f(\delta_n) + \frac{1}{n} - \left( f(\delta_n) - \frac{1}{n} \right) \right]
\]

Chapter 6 (Elementary Complex Analysis), page 66, displayed equation (6.21): Replace \( x_0 \) with \( z_0 \).

Chapter 7 (Functions of Several Variables), page 88, line 6 in Exercise 7.6: Then Show that
Chapter 8 (Heuristic Derivation of ...), page 99, bottom line:

Replace \( g_k(t) = f_{k+1}(t) - f_k(t) \)
with \( g_k(t) = f_k(t) - f_{k-1}(t) \)

Chapter 10 (... Sine and Cosine Series), page 124, bottom line, and page 125, line 4:

Replace \( 2\left(\frac{2}{k\pi}\right)^3 \left[(-1)^k - 1 \right] - \frac{2}{k\pi} \)
with \( 2\left(\frac{2}{k\pi}\right)^3 \left[(-1)^k - 1 \right] - \frac{2}{k\pi} \cdot \frac{8}{k\pi} \)

Chapter 10 (... Sine and Cosine Series), page 126, lines 5 and 9: Replace \( \frac{16}{k^2\pi^2} \) with \( \frac{16}{k^2\pi^2} \).

Chapter 10 (... Sine and Cosine Series), page 128, line 2 and 3 in problem 10.7b: \( N = \Omega, 1 \)

Chapter 11 (Inner Products, Norms, and Orthogonality), page 131, line 2:

Replace \( a^* \langle f | h \rangle + b^* \langle g | h \rangle \)
with \( a^* \langle f | g \rangle + b^* \langle f | h \rangle \).

Chapter 11 (Inner Products, Norms, and Orthogonality), page 134, text line 2 in 11.4: is some orthogonal set of nonzero functions . . .

Chapter 11 (Inner Products, Norms, and Orthogonality), page 135, line 1: Let . . . be an orthogonal set of nonzero functions . . .

Chapter 11 (Inner Products, Norms, and Orthogonality), page 140, lines 4, 6, 9 and 13: First, replace every \( \frac{p^2}{4} \) with \( \frac{p}{2} \), then replace every remaining \( p^2 \) with \( p \).

Chapter 12 (Complex Exponential Fourier Series), page 144, displayed equation (12.4): In the exponential in the last summation, replace \( \omega_n \) with \( \omega_k \).

Chapter 12 (Complex Exponential Fourier Series), page 148, line 12: “Summing ... integer N

Chapter 13 (Convergence and Fourier’s Conjecture), page 154, 2nd line from bottom: In the first summation, replace \( k = N \) with \( k = -N \).

Chapter 13 (Convergence and Fourier’s Conjecture), page 156, 2nd and 4th displayed equations from the bottom: Replace each \( \lim_{t \to 0^\pm} \) with \( \lim_{\tau \to 0^\pm} \).

Chapter 13 (Convergence and Fourier’s Conjecture), page 167, line before equation (13.10): Recalling the ... equations (13.8) and (13.8) (13.9) are...

Chapter 13 (Convergence and Fourier’s Conjecture), page 169, end of the displayed equalities at the bottom of the page: Replace \( \leq \|f\|\|g\| \) with \( \leq \frac{1}{p}\|f\|\|g\| \).
Chapter 13 (Convergence and Fourier’s Conjecture), page 173, Exercises 13.6 e, f, and g: In the formulas for \( h(t) \), \( k(t) \), and \( l(t) \), replace \( f(t - 4) \), \( f(t - 2) \), and \( f(t - 2) \) with \( h(t - 4) \), \( k(t - 2) \), and \( l(t - 2) \), respectively.

Chapter 13 (Convergence and Fourier’s Conjecture), page 175, problem 13.15, equation (13.16b): Replace \( \sum_{N=-\infty}^{\infty} \) with \( \sum_{n=-\infty}^{\infty} \).

Chapter 14 (Convergence ...: The Proofs), page 177, sentence just after 14.1 Basic Theorem ...: Our ... same as theorem 13.1 on page 134.

Chapter 14 (Convergence ...: The Proofs), page 183, 2nd displayed equation: Replace \( \frac{-x \cos(x)}{2 \cos(x)} \) with \( \frac{x}{2 \cos(x)} \).

Chapter 14 (Convergence ...: The Proofs), page 186, 3rd displayed equation: Replace \( \frac{-x \cos(x)}{2 \cos(x)} \) with \( \frac{x}{2 \cos(x)} \).

Chapter 15 (Derivatives and Integrals of Fourier Series), page 209, last line (displayed equation) in Theorem 15.13: In the last summation, replace \( b_k \) with \( a_k \).

Chapter 16 (Applications), page 215, last line of text: each of ... This gives us a bunch of ...

Chapter 16 (Applications), page 223, 2nd line from bottom: Multiply both integrals by 2 (the following line, however, is correct).

Chapter 16 (Applications), page 227, displayed formulas at top: Delete the \( \pi \) from the formula for \( \nu_k \).

Chapter 16 (Applications), page 241 Exercise 16.11, line 4: Replace the second \( \left. \frac{\partial u}{\partial x} \right|_{(0,t)} \) with \( \left. \frac{\partial u}{\partial x} \right|_{(L,t)} \).

Chapter 17 (Derivation of the Fourier Transform), page 246, formula (17.1): Replace \( \Delta x \to 0^+ \) with \( \Delta x \to 0^+ \).

Chapter 18 (Integrals on Infinite Intervals), page 271, displayed formula in problem 16: Replace \( k \text{ rect}_{(k-2)}(x) \) with \( 2^k \text{ rect}_{(0,2-k)}(x - k) \).

Chapter 19 (The Fourier Integral Transforms), page 276, last displayed equation in Exercise 19.3: Replace \( \mathcal{F} \) with \( \mathcal{F}_1 \).

Chapter 19 (The Fourier Integral Transforms), page 276, end of last displayed equation on the page: Replace \( \mathcal{F}_1[\phi(y)]_{-x} \) with \( \mathcal{F}_1[\phi(y)]_{x} \).

Chapter 19 (The Fourier Integral Transforms), page 289, displayed equation in 19.16b: Replace \( \cdots = \int_0^\infty \cdots \) with \( \cdots = -2i \int_0^\infty \cdots \).

Chapter 19 (The Fourier Integral Transforms), page 281, line 7 from top: Delete the extra \( i \) in the exponent of the last integral.
Chapter 19 (The Fourier Integral Transforms), page 283, line 2 in Exercise 19.10: form (or ... ) of an absolutely ...

Chapter 21 (Elementary Identities), page 325, first displayed equation after Some Related Symmetries: In the integral, replace \( dx \) with \( dy \).

Chapter 21 (Elementary Identities), page 325–326, the displayed equations Some Related Symmetries: Change the sign (+ or −) before each \( \sin(2\pi xy) \).

Chapter 21 (Elementary Identities), page 328, third line in problem 21.13: Replace \( \alpha > 0 \) with \( \alpha > 0 \).

Chapter 21 (Elementary Identities), page 328, last line in problem 21.16 b: Replace \( \alpha = 2i \) with \( \gamma = 2i \).

Chapter 22 (Differentiation), page 348, problem 5h: Replace \( \mathcal{F} \) with \( \mathcal{F}^{-1} \).

Chapter 22 (Differentiation), page 349, problem 7a: Taking the Fourier transform ....

Chapter 23 (Gaussian Functions), page 356, midpage, statement #2: The translation of \( g(x) \) by any complex number number \( \alpha \), ...

Chapter 23 (Gaussian Functions), page 363, line 8: The line should be

\[
\text{Im}[I_1] = -\sqrt{\frac{\pi}{|\lambda|}} \sin\left(\frac{1}{2} \theta\right) \quad \text{and} \quad \text{Im}[I_2] = \sqrt{\frac{\pi}{|\lambda|}} \sin\left(\frac{1}{2} \theta\right)
\]

Chapter 24 (Convolutions), page 375, line 2 after Alternate Definitions: often define convolution by-as

Chapter 24 (Convolutions), page 375, 2nd to last line in Alternate Definitions: may depend ... using the the Laplace ... transform

Chapter 25 (Correlation, ... ), page 399, line 3 (displayed eqn): Replace this line with:

\[
f \star \eta(t) = \int_{-\infty}^{\infty} f^*(s) \eta(s+t) \, ds = \alpha \eta_0
\]

Chapter 25 (Correlation, ... ), page 399, line 5 (displayed eqn): Replace this line with:

\[
\alpha = \int_{-\infty}^{\infty} f^*(s) \, ds
\]

Chapter 25 (Correlation, ... ), page 399, lines 11 and 12 (displayed eqns): In the integrals, replace each \( g \) with \( f \).

Chapter 25 (Correlation, ... ), page 399, lines 14 (displayed eqn): The last term should be \( \alpha \eta_0 \), not \( 2\alpha \eta_0 \).

Chapter 25 (Correlation, ... ), page 400, 2nd and 3rd line after Exercise 25.4: In each line, replace \( |u| \, |v| \) with \( ||u|| \, ||v|| \).

Chapter 25 (Correlation, ... ), page 401, displayed equation (25.9): Replace \( \left| \int_{-\infty}^{\infty} f(x)g(x) \, dx \right| \) with \( \left| \int_{-\infty}^{\infty} f(x)g^*(x) \, dx \right| \).
Chapter 26 (Identity Sequences), page 421, Figure 26.1: In the figure, replace $\epsilon = 1$, $\epsilon = 2$, and $\epsilon = 4$ with $\epsilon = \frac{1}{2}$, $\epsilon = \frac{1}{4}$, and $\epsilon = \frac{1}{8}$, respectively.

Chapter 27 (Generalizing the Classical Theory), page 438, Figure 27.1: In the figure, replace $\epsilon = 1$, $\epsilon = 2$, and $\epsilon = 4$ with $\epsilon = \frac{1}{2}$, $\epsilon = \frac{1}{4}$, and $\epsilon = \frac{1}{8}$, respectively.

Chapter 28 (Systems), page 468, line 9 from bottom: Observe ... can be viewed as an $g$ system with $\ldots$ 

Chapter 28 (Systems), page 469, 1st line in section 28.2: As noted, ... of a LSI systems to be ...

Chapter 28 (Systems), page 473, 2nd line from bottom in the displayed equation: In the integral, replace the step$(t)$ with step$(s)$.

Chapter 30 (A Starting Point for the Generalized Theory), page 500, last displayed equation: In the exponential, replace $x_0$ with $x$.

Chapter 31 (Gaussian Test Functions), page 513, line 17 (displayed eqn): Replace $e^{-\gamma(x-C)^2}$ with $e^{-\gamma(x-C)^2}$.

Chapter 31 (Gaussian Test Functions), page 516, line 14 (displayed eqn): Replace $(f^*)_*$ with $(f^*)_* = f$

Chapter 32 (Generalized Functions), page 552, Exercise 23 g, h and i: Replace $x$ with $|x|$ under the square roots.

Chapter 33 (Sequences and Series ...), page 572, line 8 in problem 33.8 (displayed eqn): Replace the lower limit $k = M$ with $k = -M$

Chapter 33 (Sequences and Series ...), page 573, line 4 in problem 33.10 a (displayed eqn): Replace the lower limit $k = -\infty$ with $k = -\infty$.

Chapter 33 (Sequences and Series ...), page 573, problem 33.10 b iii: Replace $g$ with $h$.

Chapter 34 (Basic Transform, ...), page 578, Example 34.4, last line: Replace $\mathcal{F}^{-1}$ with $\mathcal{F}$.

Chapter 35 (Generalized Products, ... Integrals), page 623, Example 35.3, 2nd line in equation (35.1): Replace the first $\text{sinc}(\pi k) \delta_k(x)$ with $\text{sinc}(\pi x) \delta_k(x)$.

Chapter 35 (Generalized Products, ... Integrals), page 623, Example 35.3, 2nd displayed equation from the bottom: Delete the first $\text{sinc}(\pi k) = \ldots$

Chapter 35 (Generalized Products, ... Integrals), page 634, 1st displayed pair of equations on the page: In the 2nd equation, replace $\lim_{\epsilon \to \infty}$ with $\lim_{\epsilon \to \infty}$.

Chapter 37 (Solving Simple Equations), page 679: Add period to footnote.

Chapter 38 (Periodic Functions and Regular Arrays), page 640, line 8 from bottom: ing that it does, ... .

Chapter 38 (Periodic Functions and Regular Arrays), page 649, 1st displayed formula after A Possible Difficulty ...: The exponential in the integral should be $e^{-i2\pi\omega t}$. 


Chapter 36 (Periodic Functions and Regular Arrays), page 659, first displayed equation in Exercise 36.9: Replace $\langle f(x - p), \phi(x) \rangle$ with $\langle f(x - p), \phi(x) \rangle = \langle f(x), \phi(x) \rangle$.

Chapter 39 (Sampling ... Discrete Fourier Transform), page 712, 4th displayed equation (the one for $f_3$): Replace $-$ with $-$.

Chapter 39 (Sampling ... Discrete Fourier Transform), page 715, 1st displayed equation: Replace $f_{k+N}$ with $\hat{f}_{k+N}$.

Chapter 39 (Sampling ... Discrete Fourier Transform), page 726, equations (39.18) and (39.19): Add the obviously missing “1” to $n = 0, 2, 3, \ldots$ and $k = 0, 2, 3, \ldots$.

Chapter 39 (Sampling ... Discrete Fourier Transform), page 733, 1st displayed equation, equation (39.22): Replace $n = 0, \pm 1, \ldots$ with $k = 0, \pm 1, \ldots$.

Chapter 39 (Sampling ... Discrete Fourier Transform), page 735, 3rd displayed equation: That formula for correlation should be $\frac{1}{\sqrt{N}} \sum_{j=0}^{N-1} x_{j-k} y_j$.

Chapter 39 (Sampling ... Discrete Fourier Transform), page 737, 3rd and 2nd displayed equations from the bottom: In the equation for $u_{M-1}$ replace $u_{2N-2}$ with $v_{2M-2}$, and in the equation for $u_{M-1}$ replace $u_{2N-1}$ with $v_{2M-1}$.

Chapter 39 (Sampling ... Discrete Fourier Transform), page 739, 1st displayed equation: The terms are missing in the middle summation. They should be $e^{-i\frac{2\pi n}{N}} v_{3j+1}$.

Chapter 39 (Sampling ... Discrete Fourier Transform), page 739, line right after the formula for $V_0$: which only requires $N + 1 \ N - 1$ “adds” ...

Chapter 39 (Sampling ... Discrete Fourier Transform), page 740, footnote: numbers we derive ... will give a slightly inflated measures ...

Chapter 39 (Sampling ... Discrete Fourier Transform), page 744, 4th displayed equation (the one just after Thus, for $N > 4,$): This should be identified as “equation” (39.33), so add (39.33) to the far right hand side.

Chapter 39 (Sampling ... Discrete Fourier Transform), page 747, last line: of $K$ to get a discrete transforms that requires ...

Chapter 39 (Sampling ... Discrete Fourier Transform), page 748, last line in exercise 39.34b: which we ... inequality (39.6)-(39.33).

ANSWERS, page 760, answers to problems 6e and 7b of chapter 9: Replace $\frac{4}{k^2 \pi^3}$ with $\frac{4}{k^2 \pi^3}$.

ANSWERS, page 761, answer to problem 6e of chapter 13: Answer should be: $1, 1, 0, -1, -1$.

ANSWERS, page 761, answer to problem 6c of chapter 15: Answer should be:

$$\sum_{k=-\infty}^{\infty} \frac{i}{k\pi} \left[ (-1)^k - 1 \right] e^{ik\pi t}$$
ANSWERS, page 761, answer to problem 6d of chapter 15: Answer should be:

\[ \text{oddsaw}' = 1, \quad FS[\text{oddsaw}'] = 1 \]

ANSWERS, page 762, answers to problems 14a of chapter 16: It should be

\[ \sum_{k=1}^{\infty} \left[ A_k \cos(\nu_k t) + B_k \sin(\nu_k t) \right] e^{-\beta t} \sin \left( \frac{k\pi}{L} x \right) \]

where the \( A_k \)'s and \( B_k \)'s are arbitrary constants and \( \nu_k = \frac{1}{L} \sqrt{(kc \pi)^2 - (\beta L)^2} \).

ANSWERS, page 763, answer to problem 11o of chapter 21: Answer should be

\[ \frac{1}{2} \left[ (3 + i2\pi(\omega + 1))^{-1} + (3 + i2\pi(\omega - 1))^{-1} \right] \]

ANSWERS, page 763, answer to problem 13c of chapter 21: Answer should be

\[ \frac{2\pi}{3} e^{(1+3i)8\pi(\omega-3)/3} \text{step}(3 - \omega) \]

ANSWERS, page 763, answer to problem 4i of chapter 22: Answer should be

\[ \frac{1}{2} \pi^{-3} \omega^{-3} \left[ (2\pi^2 \omega^2 - 1) \sin(2\pi \omega) + 2\pi \omega \cos(2\pi \omega) \right] \]

ANSWERS, page 764, answer to problem 8i of chapter 23: Replace \[ \left[ 1 - \frac{2\pi^2}{\gamma} \omega \right] \] with \[ \left[ 1 - \frac{2\pi^2}{\gamma} \omega^2 \right] \].

ANSWERS, page 764, answer to problem 15aii of chapter 24: Replace all \( \omega \)'s with \( x \)'s.

ANSWERS, page 765, answer to problem 20a of chapter 24: Answer should be

\[ \frac{1}{4} \left[ e^{4(t-1)} - e^{4(t+1)} \right] \text{step}(-1 - t) + \frac{1}{4} \left[ e^{4(t-1) - 1} \right] \text{pulse}_1(t) \]

ANSWERS, page 769, answer to problems 33 of chapter 39: Answer should be: \( 3N^2 \) (includes index arithmetic).

ANSWERS, page 769, answer to problems 34b of chapter 39: Answer should be: \( 9N \log_2 N + N \).