

Complex Analysis for Mathematics and Engineering: 5th Edition

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Typos for the Second Printing

Chapter 1–Answer Section

• Section 1.3

– Page 582, Exercise 1e.

Replace “ $\sqrt{(x-1)^2 + y^2}$ ” with “ $(x-1)^2 + y^2$ ”.

• Section 1.4

– Page 584, Exercise 7.

The answer should read as follows:

$\text{Arg}(z_1 z_2) = \text{Arg}(-4i) = \pi$. However, $\text{Arg}(z_1) + \text{Arg}(z_2) = \frac{2\pi}{3} + \frac{5\pi}{6} = \frac{3}{2}\pi$.

• Section 1.5

– Page 585, Exercise 11b.

Replace “Let $z = e^{i\theta}$ ” with “Let $z = e^{i\theta}$.” (i.e., insert a period after $e^{i\theta}$).

Chapter 2–Text

• Section 2.1

– Page 53, line 5.

Replace “of R to be function” with “of R to be a function”.

– Page 58, lines 4–5.

The phrase “linear transformation” should be in bold.

– Page 62, Exercise 9.

Change the wording in the exercise statement as follows:

replace “total charge” with “electric field intensity”.

– Page 63, Exercise 11b.

Replace “ $h(z) = f(g(z))$ ” with “ $h(z) = g(f(z))$ ”.

– Page 63, Exercise 12.

Eliminate part d. Replace “Find” with “Sketch” in parts a, b, and c.

• Section 2.2

– Page 70, Exercise 10.

The reference to Figure 2.14 in line 3 of the exercise should be to Figure 2.12.

- **Section 2.5**

- Page 91, Exercise 10.

Replace the phrase “outside the disk $D_1(1) = \{w : |w - 1| < 1\}$ ” with “outside the circle $C_1(1) = \{w : |w - 1| = 1\}$ ”.

Chapter 2–Answer Section

- **Section 2.1**

- Page 586, Exercise 1c.

Replace “ $2i$ ” with “2”.

- **Section 2.2**

- Page 587, Exercise 1g.

The answer should read as follows:

The infinite strip $\{(u, v) : 1 < v < 8\}$, which is the region in the uv plane between $v = 1$ and $v = 8$.

- Page 587, Exercises 7a and 7c.

For clarity, change the answers to the polar form $\rho e^{i\phi}$ so that they read as follows:

Exercise 7a: The set $\{\rho e^{i\phi} : \rho > 8, \text{ and } \frac{3\pi}{4} < \phi < \pi\}$.

Exercise 7c: The set $\{\rho e^{i\phi} : \rho > 64, \text{ and } \frac{3\pi}{2} < \phi < 2\pi\}$.

- **Section 2.3**

- Page 588, Exercise 5a.

The last equation should read $\lim_{z \rightarrow 0} \bar{z} = 0$.

- Page 588, Exercise 17.

Replace “Rewrite f as in Exercise 9” with “Rewrite f as in Exercise 11”.

- Page 588, Exercise 19.

Replace “that if $z \in D_\delta^*(0)$ ” with “that if $z \in D_\delta^*(z_0)$ ”.

- **Section 2.4**

- Page 589, Exercise 3.

The last sentence should read as follows:

Thus, the range of $f_{2\pi}(z)$ is $\{z = \rho e^{i\phi} : \rho > 0 \text{ and } \pi < \phi \leq 2\pi\}$.

- Page 589, Exercise 5a.

The last equality should be $|z|e^{i\text{Arg}(z)} = z$.

- **Section 2.5**

- Page 589, Exercise 11.

Replace “The exterior of the disk $D_1(-\frac{i}{2}) = \{(u, v) : u^2 + (v + \frac{1}{2})^2 > 1\}$ ” with
 “The exterior of $C_1(-\frac{i}{2})$, which is $\{(u, v) : u^2 + (v + \frac{1}{2})^2 > 1\}$ ”.

- Page 590, Exercise 21. Change the answer so that it reads as follows:

Broadly speaking, $\pm\infty$ are designations for limits in Calculus indicating quantities that get arbitrarily positive or negative. There is no such signed measure in Complex Analysis, only a measure of how far things are from the origin. In that sense, the point ∞ on the Riemann sphere can be equated with both $\pm\infty$ in real analysis. Elaborate and give some other comparisons.

Chapter 3–Text

- **Section 3.2**

- Page 112, Exercise 16b.

Replace “ $\frac{1}{2}[u_x - v_y + i(y_x + u_y)] = 0$ ” with “ $\frac{1}{2}[u_x - v_y + i(v_x + u_y)] = 0$ ”.

- **Section 3.3**

- Page 120, Exercise 6.

Replace “ $u_2 = x^3 - 3xy^2$ ” with “ $u_2(x, y) = x^3 - 3xy^2$ ”.

Chapter 3–Answer Section

- **Section 3.2**

- Page 591, Exercise 1g.

Replace the last equation (“ $f'(z) = 2x$ ”) with “ $f'(z) = f'(x, 0) = 2x$ ”.

- Page 591, Exercise 9a.

Replace “and $u_y = \cosh x \sin y = -v_x$.” with “and $u_y = \cosh x \cos y = -v_x$ ”.

- Page 591, Exercise 11c.

The answer should read as follows:

f is analytic in quadrants I and III and differentiable on the x - and y -axes.

- **Section 3.3**

- Page 592, Exercise 13a.

The solution should read as follows:

$$f(z) = \frac{1}{x+iy} = \frac{x}{x^2+y^2} + i\frac{-y}{x^2+y^2}.$$

Chapter 4–Text

- **Section 4.4**

- Page 151, second line after the phrase “**Calculation for D** ”.
Replace “ $<$ ” with “ \leq ”.

Chapter 4–Answer Section

- **Section 4.2**

- Page 140, Exercise 7.
Per student requests, replace “Prove that if $z = c$ ” with
“Prove that if a complex number c ”.

- **Section 4.4**

- Page 595, Exercise 7.
The “ (b_n) ” term should be deleted from the next to the last expression so that it reads as follows:

$$\sum_{n=1}^{\infty} n(n+k)(n+k-1)\cdots(n+1)c_{n+k}(z-\alpha)^{n-1}.$$

Chapter 5–Text

- **Section 5.4**

- Page 178, the line just below Equation (5–31).
Per student request, reword the line so that it reads as follows:
Let $z = x + iy$ and subtract Equation (5–31) from Equation (5–30). Solving for $\sin z$ then gives
- Page 181
Replace “ $\sin z \cosh y$ ” with “ $\sin x \cosh y$ ” in the right side of the first equation so that it begins as follows:

$$|\sin z|^2 = |\sin x \cosh y + i \cos x \sinh y|^2$$
- Page 186, Exercise 3.
The reference should be to Figures 5.7 and 5.8

Chapter 5–Answer Section

- **Section 5.1**

- Pages 595–596, Exercises 5, 7a, and 7c.
Relabel: the answer for Exercise 5 should be the answer for Exercise 7; the answers listed for Exercises 7a and 7c should be for Exercises 5a and 5c. After relabeling, of course, put the answers in their proper order.

- **Section 5.3**

- Page 597, Exercise 7.

The answer should read as follows:

No. $1^{a+ib} = e^{-b2\pi n} \cos(a2\pi n) + ie^{-b2\pi n} \sin(a2\pi n)$, where n is an integer.

Chapter 6–Text

- **Section 6.2**

- Page 202, Definition 6.2.

Replace “ $\int_C f(z)dt$ ” with “ $\int_C f(z)dz$ ” (i.e., replace the “ dt ” with “ dz ”).

- Page 213, Exercise 10b.

Replace “ $2\pi \left(\frac{\pi+\ln R}{R}\right)$ ” with “ $2\pi \left(\frac{(\ln R)^2+\pi^2}{R}\right)$ ”.

- **Section 6.3**

- Page 219, second line of the proof.

Replace “We then construct” with “To do so, construct”.

- Page 221, second line of Example 6.13

Replace “does not lie interior to C ” with “does not lie on or interior to C ”.

- Page 227, Figure 6.28 (b).

The two circular curves should be touching each other as in Figure 6.28 (a).

- **Section 6.6**

- Page 243, Equation (6–54).

Replace “ $= 0$ ” with “ $= (0)(2\pi) = 0$ ”.

- Page 248, Exercise 7.

Rephrase parts (a) and (b) so that the exercise reads as follows:

(a) Let f be analytic and nonconstant in the domain D . If $f(z) \neq 0$ for all z in D , then $|f(z)|$ does *not* attain a minimum value at any point z_0 in D .

(b) Show that the requirement that $f(z) \neq 0$ in part a is necessary by finding an example of a function defined on D for which $f(z) = 0$, and yet whose minimum *is* attained somewhere in D .

- Page 248, Exercise 11.

Replace “*Hint*: Use both” with “*Hint*: Refer to Exercise 7 and use both”.

Chapter 6–Answer Section

- **Section 6.4**

- Page 601, Exercise 13.

Replace “ $-\frac{1}{2} \ln \sqrt{2}$ ” with “ $-\ln \sqrt{2}$ ”.

- **Section 6.6**

- Page 601, Exercise 1.

The answer should be $(z + i)(z - i)(z - 2 + i)(z - 2 - i)$.

- Page 602, Exercise 7a.

Replace “If $|f(z)| \geq m$ for all z in D , where $m > 0$,” with “If $f(z) \neq 0$ for all z in D ,”.

- Page 602, Exercise 11.

Reword the answer so that it reads as follows:

(By contraposition) If f does not have a zero, then by the minimum modulus theorem, the minimum of $|f|$ occurs on the boundary (prove that this result follows from Exercise 7). Since $|f|$ is constant on the boundary, both the minimum and maximum of $|f|$ are the same on the boundary. This condition implies that the maximum of $|f|$ also occurs in $D_1(0)$ (explain!), which by the maximum modulus theorem means that f is constant in $D_1(0)$.

Chapter 7–Text

- **Section 7.1**

- Page 255, Exercise 3c.

Replace “ $\sum_{k=0}^{\infty} \frac{z^k}{z^{2k+1}}$ ” with “ $\sum_{k=0}^{\infty} \frac{z^{2k}}{z^{k+1}}$ ”.

- **Section 7.2**

- Page 258, Equation (7–8).

Replace “ $|z_0 - a| = r$ ” with “ $|z_0 - \alpha| = r$ ” (i.e., replace the “ a ” with “ α ”).

- Page 265, Exercise 7.

For part b, replace “ $g(z)$ ” with “ $f(z)$ ”. For part c replace “ $h(z)$ ” with “ $f(z)$ ”.

- **Section 7.4,**

- Page 283, Exercise 1e.

Replace “ $z^2 + 10z + 0$ ” with “ $z^2 + 10z + 9$ ”.

Chapter 7–Answer Section

- **Section 7.2**

- Page 604, Exercise 15.

Change “Then apply Corollary 7.2.” to “Then apply Corollary 7.2 in the manner of Example 7.2.”

- **Section 7.4**

- Page 605. The line (that begins with “Simple zeros”) immediately after the answer for Exercise **1i** should be labeled in bold with “**1k**”.
- Page 605, Exercise 2k.
Replace “ $z = 2n\pi$ ” with “ $z = 2n\pi i$ ”.
- Page 605, Exercise 3a.
Replace “Removable singularity at the origin” with “Simple pole at the origin”.

Chapter 8–Text

- **Section 8.3**

- Page 311, Exercise 8.
Replace “ $(x^2 + 4)^3$ ” with “ $(x^2 + 4)^2$ ”.

- **Section 8.7**

- Page 327, Exercise 11.
Replace “ $f(z) = \exp(-z^2)$ ” with “ $f(z) = \exp(iz^2)$ ”.

Chapter 8–Answer Section

- **Section 8.1**

- Page 607, Exercise 11.
Reword the answer so that it reads as follows:
By Theorem 8.2, $\text{Res}[g, n] = \lim_{z \rightarrow n} (z - n)\pi f(z) \cot \pi z = \pi f(z) \cos(\pi z) \frac{z-n}{\sin(\pi z)}$, where n is any integer. Use L’Hôpital’s rule to get $\lim_{z \rightarrow n} \cos(\pi z) \frac{z-n}{\sin(\pi z)} = \frac{1}{\pi}$. Explain how this calculation and the fact that f is analytic at n then give the result.

- **Section 8.3**

- Page 608, Exercise 7.
The answer should be $\frac{\pi}{2}$.

Chapter 9–Text

- **Section 9.1,**

- Page 354, next to last line.
Replace “ $a = \frac{5}{4}$ ” with “ $a = \frac{4}{5}$ ”.
- Page 355, Figure caption for Figure 5.4.
Replace “ $\frac{5}{4}y[n] + 1$ ” with “ $\frac{4}{5}y[n] + 1$ ”.

Chapter 10–Answer Section

• Section 10.1

- Page 615, Exercise 3.

In the third line of the answer replace “ $\text{Arg}f'(1+i) = \frac{3\pi}{2}$ ” with “ $\text{Arg}f'(1+i) = -\frac{\pi}{2}$ ”.

- Page 615, Exercise 5.

The second line of the answer should be changed to read as follows:

$$f'(-\frac{\pi}{2} + i) = i \sinh 1, \alpha = \text{Arg}f'(-\frac{\pi}{2} + i) = \frac{\pi}{2}, |f'(-\frac{\pi}{2} + i)| = \sinh 1;$$

Chapter 11–Text

• Section 11.5

- Page 453, Exercise 3

Replace “ $T(0, y) = 10$, for $y < 1$ ” with “ $T(0, y) = 10$, for $y > 1$ ”.

- Page 454, Exercise 5

Replace “ $T(x, y) = 0$, for $\frac{-\pi}{2} < x < \frac{\pi}{2}$ ” with “ $T(x, 0) = 0$, for $\frac{-\pi}{2} < x < \frac{\pi}{2}$ ”.

• Section 11.8

- Page 484, Exercise 2a.

Replace “ $\frac{4u^2}{(r+\frac{1}{r})^2} + \frac{4v^2}{(r-\frac{1}{r})^2} = 1$ ” with “ $\frac{u^2}{(r+\frac{1}{r})^2} + \frac{v^2}{(r-\frac{1}{r})^2} = 1$ ”.

- Page 484, Exercise 2b.

Replace “ $\frac{u^2}{\cos^2 \theta} - \frac{v^2}{\sin^2 \theta} = 1$ ” with “ $\frac{u^2}{4 \cos^2 \theta} - \frac{v^2}{4 \sin^2 \theta} = 1$ ”.

- Page 485, Exercises 6

Replace the word “cardioid” with the phrase “cardioid-like curve”.

- Page 485, Exercise 7

Replace the word “cardioid” with the phrase “cardioid-like curve”.

• Section 11.11

- Page 509

Replace “ $F(z) = \lim_{a \rightarrow 0} \frac{\log(z) - \log(z-a)}{2a}$ ” with “ $F(z) = \lim_{a \rightarrow 0} \frac{\log(z+a) - \log(z-a)}{2a}$ ”.

Chapter 11–Answer Section

• Section 11.3

- Page 617, Exercise 1.

The answer should read as follows:

$$\phi(x, y) = \frac{y}{2\pi} \ln \frac{(x-1)^2 + y^2}{(x+1)^2 + y^2} + \frac{x}{\pi} \text{Arctan} \frac{y}{x-1} - \frac{x}{\pi} \text{Arctan} \frac{y}{x}.$$

- **Section 11.9**

- Page 619, Exercise 3
Replace “ $f'(z) = A(z+1)^{\frac{1}{2}}(z-1)^{\frac{1}{2}}$ ” with “ $f'(z) = A(z+1)^{\frac{1}{2}}(z-1)^{-\frac{1}{2}}$ ”.
- Page 619, Exercise 9
Replace “ $x_2 =$ ” with “ $x_2 = 0$ ”.

Chapter 12–Text

- **Section 12.3**

- Page 535. Problems 2–5 should be combined into one Exercise numbered 2 with parts a,b,c.

- **Section 12.4**

- Page 539, Table 12.1, row 5 (Frequency shifting).
Replace “ $\mathfrak{F}(e^{-iw_0t}U(t))$ ” with “ $\mathfrak{F}(e^{iw_0t}U(t))$ ” (i.e., no negative exponent).
- Page 540, Exercise 5.
The equation should read as follows:
$$\mathfrak{F}(e^{-a|t|}) = \frac{a}{\pi(a^2+w^2)}, \text{ for } a > 0.$$
- Page 540, Exercise 7.
Replace “ $\mathfrak{F}\left(\frac{i \sin \pi t}{1-t^2}\right)$ ” with “ $\mathfrak{F}\left(\frac{\sin \pi t}{t^2-1}\right)$ ”.
- Page 540, Exercise 9.
Replace “ $\frac{1-|w|}{4\pi}$ ” with “ $\frac{1-|w|}{4}$ ”.
- Page 541, Exercise 9.
Replace “ $\frac{1-|w|}{4\pi}$ ” with “ $\frac{1-|w|}{4}$ ”.

- **Section 12.6**

- Page 553, Exercise 7.
Replace “ $t - 1 + e^{t^2}$ ” with “ $t - 1 + e^{-t^2}$ ”.

- **Section 12.7**

- Page 557, line 5.
Replace “ $1 - \cos t$ ” with “ $1 + \cos t$ ”.

- **Section 12.8**

- Page 562, Exercise 8
Replace “ $\ln \frac{s^2}{s^2+1}$ ” with “ $-\frac{1}{2} \ln \frac{s^2}{s^2+1}$ ”.

Chapter 12–Answer Section

- **Section 12.4**

- Page 621, Exercise 5.

The solution should be $\mathfrak{F}(e^{-a|t|}) = \frac{a}{\pi(a^2+w^2)}$, for $a > 0$.

- Page 621, Exercise 9.

Replace “ $\frac{1-|w|}{4\pi}$ ” with “ $\frac{1-|w|}{4}$ ”.

- **Section 12.5**

- Page 621, Exercise 1

Replace “ $(0 + 0i) = \frac{-1}{\sigma+i\tau} = \frac{1}{s}$ ” with “ $(0 + 0i) - \frac{-1}{\sigma+i\tau} = \frac{1}{\sigma+i\tau} = \frac{1}{s}$ ”.

- **Section 12.10**

- Page 624, Exercise 15

Replace “ $\mathcal{L}(e^t)\mathcal{L}(\cos t)$ ” with “ $\mathcal{L}(e^{-t})\mathcal{L}(\cos t)$ ”.