Typos and Corrections for the 2015 printing of
Modern Electrodynamics

Preface
p. xx, 6th line of 2nd complete paragraph: change “into a issue” to “into an issue”.

Chapter 2
p. 30, Eq. (2.4): change $q$ to $Nq$ in front of the integral.

p. 38, Section 2.3, 2nd line of 2nd paragraph: change “prove” to “establish”.

p. 38, Section 2.3, 3rd line from the bottom: change “agrement” to “agreement”.

p. 45, Section 2.4.2, Eq. (2.62): on the right hand side, change $E_z(\infty)$ to $\epsilon_0E_z(\infty)$.

p. 49, Eq. (2.71), rightmost equation, 1st member of right side: change $c\rho$ to $c\rho_e$.

p. 50, Section 2.6, Eq. (2.75), rightmost member: change $I_1$ to $I_2$.

p. 50, Section 2.6, 1st and 2nd line immediately below Eq. (2.75): change $I_2$ to $I_1$.

p. 55, Section 2.7 at the top, 2nd line: change “Midgal” to “Migdal”.

p. 57, Problem 2.13, part (c): make the change

$$\frac{r_1 \Phi}{L^2} \Rightarrow r_1 \Phi.$$

Chapter 3

p. 58: Change $\rho^*(\mathbf{r})$ to $\tilde{\rho}(\mathbf{r})$ in Eq. (3.3) and Eq. (3.4) and in the lines immediately above and below these equations.

p. 59: Change $\rho^*(\mathbf{r})$ to $\tilde{\rho}(\mathbf{r})$ in Eq. (3.9), in the line immediately above Eq. (3.9), and in footnote 1.
p.59: Change $\rho^*$ to $\bar{\rho}$ in the two lines immediately below Eq. (3.9).

p. 59: Change $\mathbf{F}^*$ to $\mathbf{\tilde{F}}$ in the line immediately below Eq. (3.9).

p. 78, 3rd line below Eq. (3.80): make the change

$$ E = q \mathbf{\hat{r}} / 4\pi\epsilon_0 r \Rightarrow E = q \mathbf{\hat{r}} / 4\pi\epsilon_0 r^2 $$

p. 86, Problem 3.12, second line of problem statement: change “shell” to “infinitesimally thin shell”.

Chapter 5

p. 147, Change $\Delta\bar{U}_E$ to $\Delta\mathbf{\tilde{U}}_E$ in Eq. (5.78), Eq. (5.81), and Eq. (5.82).

p. 184, Eq. (6.114): change $\mathbf{D}$ to $\mathbf{E}$ as the variable held constant in the middle partial derivative.

p. 189, first line: change “identify” to “identity”.

Chapter 7

p. 206: Eq. (7.43): change to

$$ a_m = \frac{\Omega_m(1 - e^{-m\pi})}{2 \sinh(m\pi)} \quad \text{and} \quad b_m = \frac{\Omega_m(e^{m\pi} - 1)}{2 \sinh(m\pi)} $$

Chapter 8

p. 252, Eq. (8.56): change the integrand from $d^3 r \, \varphi(r)$ to $dS \, \varphi(r)$
Chapter 9

p. 284, Eq. (9.46) and Eq. (9.47): change $\varphi_1 - \varphi_2$ to $\varphi_2 - \varphi_1$

Chapter 10

p. 301: Change $j^*(\mathbf{r})$ to $j(\mathbf{r})$ in Eq. (10.3) and Eq. (10.4) and in the sentences immediately above and below these equations.

p. 312, 1st line after the 1st equation in the gray box: make the change

$$K_\pm = \hat{\rho}l/2\pi\rho \quad \Rightarrow \quad K_\pm = \pm \hat{\rho}l/2\pi\rho$$

p. 331, Problem 10.9, part (c), last line: make the change

$$j(z) \quad \Rightarrow \quad K(z)$$

Chapter 11

p. 339, Eq. (11.18): change $S_{kk}$ to $S_{jj}$ both times it occurs.

Chapter 12

p. 369, 2nd line of footnote 1: change the expression to

$$3j_2(\mathbf{r}) \cdot (\mathbf{r} - \mathbf{r}') j_1(\mathbf{r}') \cdot (\mathbf{r} - \mathbf{r}')/|\mathbf{r} - \mathbf{r}'|^2 - 2j_2(\mathbf{r}) \cdot j_1(\mathbf{r}')$$

p. 370-371. I am grateful to Prof. Thom Curtright of the University of Miami for suggesting this superior version of Example 12.2: Replace everything from the beginning to the paragraph on page 371 which begins “In light of . . .” by the following:

A negligibly thin and very long conducting ribbon has width $w$ and carries a uniform surface current with density $K = I/w$ in the direction perpendicular to its width. Figure 12.3 shows a helical sheath solenoid made by wrapping this ribbon
tightly around the surface of a long and non-conducting cylinder of radius $R$. Assume that the vector $\mathbf{K}$ makes an angle $\theta$ with respect to the $+\mathbf{\hat{z}}$ direction. Find the magnetic field inside and outside the solenoid (regarded as infinitely long) and the force per unit area $\mathbf{f}$ which acts on the ribbon. Show that there is a critical angle $\theta_c$ where $f(\theta_c) = 0$ and discuss the cases $\theta < \theta_c$ and $\theta > \theta_c$ physically.

![Figure 12.3: A helical sheath solenoid. The gaps (white) between adjacent turns of the tightly wrapped conducting ribbon (gray) should be regarded as infinitesimally narrow.](image)

The surface current density of this solenoid is

$$\mathbf{K} = \left( \mathbf{\hat{z}} \cos \theta + \mathbf{\hat{\phi}} \sin \theta \right) \frac{I}{w}.$$ 

Ampère’s law in its most elementary form and superposition give the total magnetic field inside and just outside this solenoid as

$$\mathbf{B}_{\text{in}} = \frac{\mu_0 l}{w} \sin \theta \mathbf{\hat{z}} \quad \mathbf{B}_{\text{out}} = \frac{\mu_0 l}{2R} \mathbf{\hat{\phi}}$$

From (12.4), the force density on the surface is $\frac{1}{2} \mathbf{K} \times (\mathbf{B}_{\text{in}} + \mathbf{B}_{\text{out}})$. Namely,

$$\mathbf{f} = \frac{\mu_0 l^2}{2w} \left[ \frac{\sin^2 \theta}{w} - \frac{\cos \theta}{2\pi R} \right] \mathbf{\hat{\rho}}.$$
We rewrite this expression by noting that the geometrical condition for a tight wrapping of the ribbon (no gaps or overlaps) is \( w = 2\pi R \cos \theta \). Therefore,

\[
f = \frac{\mu_0 I^2}{2w^2} \left[ \sin^2 \theta - \cos^2 \theta \right] \hat{\rho}.
\]

The critical angle where \( f \) vanishes is \( \theta_c = \pi/4 \).

p. 374, 1<sup>st</sup> line after Eq. (12.43): change “sufficient” to “sufficiently”

Chapter 13

p. 418, Eq. (13.47), topmost and rightmost expression: \( nr < R \Rightarrow r < R \).

Chapter 16

p. 539, 4<sup>th</sup> line after Eq. (16.21): replace “postive” by “positive”.

p. 560, end of the 3<sup>rd</sup> line below Eq. (16.120), make the change:

\[
w_0 \text{ to } 2w_0 \quad \Rightarrow \quad \pi w_0^2 \text{ to } 2\pi w_0^2
\]

p. 561, next-to-last line of Example 16.4: replace “Guoy” by “Gouy”.

p. 562, Eq. (16.123), left member:

\[
\exp[i \mathbf{k} \cdot \mathbf{r} - \omega(\mathbf{k})t] \Rightarrow \exp[i(\mathbf{k} \cdot \mathbf{r} - \omega(\mathbf{k})t)]
\]

p. 570, beginning of the 1\textsuperscript{st} line after Eq. (16.171):

\[ \text{Equation (16.8)} \quad \Rightarrow \quad \text{Equation (16.9)} \]

p. 570, two lines above Eq. (16.174):

\[ \pi_e = -c \pi_m. \quad \Rightarrow \quad \pi_e = c \pi_m. \]

**Chapter 17**

p. 589, first line after Eq. (17.32): change \( k_R \) to \( k_T \)

p. 617, Problem 17.3, last line of part (a), change “than” to “that”

**Chapter 18**

p. 628, Eq. (18.26), make the change:

\[ \frac{1}{16\pi^2} \quad \Rightarrow \quad \frac{1}{32\pi^2} \]

**Chapter 20**

p. 727, Eq. (20.70), delete the rightmost member so this equation reads:

\[ \rho(r, t) = -p(t) \cdot \nabla \delta(r). \]

**Chapter 21**

p. 782, 3\textsuperscript{rd} line of 1\textsuperscript{st} paragraph below Eq. (21.23): change (21.20) to (21.17).

p. 791, Example 21.3, end of 2\textsuperscript{nd} line after 2\textsuperscript{nd} equation: change (21.20) to (21.17)
Chapter 23

p. 872. In the denominators of both Eq. (23.11) and Eq. (23.12):

\[ R(t)g(t) \Rightarrow |R(t)g(t)| \]

\[ R - \beta \cdot R \Rightarrow |R - \beta \cdot R| \]

p. 908, Eq. (23.180), last term:

\[ \frac{q}{2\pi \varepsilon_0} \Rightarrow \frac{q}{2\pi \varepsilon} \]

p. 909, last line: change “This the energy” to “This is the energy”

Chapter 24

p. 927, box at the top, last paragraph. The name “Schwarzchild” appears twice. Change both to “Schwarzschild”.

Index

p. 974: change “Schwarzchild” to “Schwarzschild”.