Mathematical Methods for Optical Physics and Engineering
errata

August 22, 2012

- (p. 30): In Eq. (2.7), the last term in the curved brackets should read $v_z[\mathbf{r}(t)]dz/dt$.
- (p. 31): The solution to Example 2.1 should be $+23/2$, not $-23/2$.
- (p. 31): In Eqs. (2.10) and (2.11), the calculation of dr is incorrect. The proper argument begins with

  $$d\mathbf{r} = \hat{\mathbf{x}}dx + \hat{\mathbf{y}}dy + \hat{\mathbf{z}}dz.$$

  This implies that

  $$\frac{d\mathbf{r}}{dt} = \hat{\mathbf{x}}\frac{dx}{dt} + \hat{\mathbf{y}}\frac{dy}{dt} + \hat{\mathbf{z}}\frac{dz}{dt}.$$

  If we calculate the absolute value of $d\mathbf{r}/dt$, we find that

  $$\frac{dr}{dt} = \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2 + \left(\frac{dz}{dt}\right)^2}.$$

  From this, we may write

  $$\frac{dr}{dt}dt = \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2 + \left(\frac{dz}{dt}\right)^2}dt.$$

- (p. 147): Eq. (5.32) is missing an equals sign; it should read:

  $$\mathbf{X} = \mathbf{A}^\dagger\mathbf{A} = \sum_{i=1}^{m} x_i \left|\mathbf{x}_i\right\rangle \left\langle\mathbf{y}_i\right| \left|\mathbf{y}_i\right\rangle \left\langle\mathbf{x}_i\right|.$$

- (p. 151): Under Eq. (5.54), "does not lies in the range..." should be "does not lie in the range...".

- (p. 163): In the quotient theorem, the last line should read, "in a *fourth rank* mixed tensor C^j_{ikl},...".
- (p. 171): Under Eq. (5.170), it should read, "but that $\mathbf{e}^i \cdot \mathbf{e}^j \neq \delta^j_i$."
- (p. 174, problem 2): The -2 in the matrix should be $+2$.
- (p. 176, problem 20): The equation in the problem should read:

$$[\mathbf{A} \times \mathbf{B}] \cdot [\mathbf{C} \times \mathbf{D}] = (\mathbf{A} \cdot \mathbf{C})(\mathbf{B} \cdot \mathbf{D}) - (\mathbf{A} \cdot \mathbf{D})(\mathbf{B} \cdot \mathbf{C}).$$

- (p. 287): In Eq. (9.121), the power on the derivative with respect to z should be $n-1$.
- (p. 330): In Eq. (10.57), $+b$ should be $-b$.
- (p. 358): "Lorentian" should read "Lorentzian".
- (p. 385, problem 19): There is an unfortunate mix-up of x's and t's. In the definition of $f(t)$, all x's should be t's.
- (p. 527): In Eqs. (15.136) and (15.137), the normalization in front of the integral should be $1/(a^m 2\pi)$.
- (p. 530): Eq. (15.161) should read $\alpha^2 u_{xx} - u_t = 0$.
- (p. 533): Should be $1/\alpha^2$ in Eq. (15.188), and in equations which follow.
- (p. 538): In example 15.8, it should be explicitly stated that $L = 1$.
- (p. 539): In Eq. (15.229), the exponent on the A_n-term should have a "$-$" sign.
- (p. 562): In Eq. (16.66), the final part of the equation should be

$$U(\theta) = \frac{2\pi a}{k \sin\theta} J_1(ka \sin\theta).$$

- (p. 589): "Analogous to the Bessel..." should read, "In analogy to the Bessel...".
- (p. 632): Eq. (18.63) should read: $\eta'' - 2x\eta' + (\lambda - 1)\eta = 0$.
- (p. 675): In Eq. (19.56), the last term which has $G(\mathbf{r}', \mathbf{r})$ should be $G(\mathbf{r}, \mathbf{r}')$. (In fact, due to the symmetry of the Green's function, the order doesn't matter, but it can be confusing.)
- (p. 684): Above Eq. (19.115), it should read "homogeneous", not "inhomogeneous".
- (p. 684): Eq. (19.116) should have a "τ" on the right-hand side, not a "t".

- (p. 684): After Eq. (19.121), should be a "τ", not a "t".
- (p. 685): In the figure, should be "τ", not "t".
- (p. 705): In Eq. (19.254), "$\nabla \cdot \mathbf{P}$" should be "$-\nabla \cdot \mathbf{P}$".
- (p. 705): In Eq. (19.259), the sign should be negative: $\mathbf{J}_m = -ikc\mathbf{M}$, with a corresponding minus sign in Eq. (19.264). This is significant in order to satisfy the continuity equation between $\mathbf{J}_m$ and ρ_m.
- (p. 709): Eq. (19.290) is missing a term, and should read

$$\nabla \times (\nabla \times \mathbf{H}) - k^2\mathbf{H} = -\frac{4\pi ik}{c}\mathbf{J}_m.$$

- (p. 749-750): Eq. (21.7) is (21.6) repeated.