My list of errata in McQuarrie, *Mathematical Methods for Scientists and Engineers* (2003)

D. Sober 07 November 2011

(Please inform me of others – I will update this list.)

Chapter 1

Page

41 Eq. (9): add **+** sign before second lim

58 Example 3: "Choose $M(t) = t^2 e^{-\alpha t^2}$ because ..."

Chapter 2

85 In The Weierstrass *M* Test: "*and* ΣM_n *converges*, ..."

90 Before last paragraph: "If a power series $\Sigma a_n (x-c)^n$ converges for $\underline{x - c = \xi}$, then ... in the interval $\underline{|x-c| < |\xi|}$ ... and uniformly in the interval $\underline{|x-c| \le |\eta| < |\xi|}$, where ..."

97 Example 3: $\sinh^{-1} x = x + \sum_{n=1}^{\infty} \ldots = x - \frac{1}{2 \cdot 3} x^3 + \ldots$

107 2 lines after (1): $"dv" = +e^{-z}\, dz$

107 After (2): "Equation **2** is an identity: ..."

107 2 lines after (3): "or $0.00107 < E_1(5) < 0.00117$, ..."

108 After (5): "... → 0 as $x \to \infty$;" (not $x \to 0$)

Chapter 3

153 Not an error, but note that Spiegel *et al.* (Schaum tables) use a different convention for definition of B_n. McQuarrie's convention seems to be more common.

Chapter 4

166 Last words of page are missing: "The boundaries of the domain are numbered in *the figure*"?

168 Problem 3: There should be no "*i*" in "$\upsilon(x,y) = -iy$ /...".

188 Problem 7: "...indicating the appropriate branch cut in the *z-plane."*

Chapter 5

214 End of Example 1: Spelling should be "Larmor frequency"

Chapter 6

235 Figure 6.14: Equation describes an oblate spheroid (thinner in *x*-direction), but figure depicts a prolate spheroid (longer in *x*-direction.)

247 $\ldots + f_y^2(a,b)$ in denominator of (4)

251 Equation between (9) and (10): $\frac{\partial^2 A}{\partial V \partial T} = \left[\frac{\partial}{\partial V}\left(\frac{\partial A}{\partial T}\right)_V\right]_T = \ldots$ (outer subscript is *T*, not *S*)

270 Equation for *df* (after Example 4) is missing "*dt* " from both terms in sum.

271 Example 2: The numerator of the *x*-component of $\boldsymbol{E}$ should be $2x^2 - y^2 - z^2$.

Fig. 6.33 shows a pair of ± charges with finite separation. This does not correspond to the expressions for the dipole potential (Eq. (2)) and field, which are valid only for a "point dipole", where the separation of the two charges is negligible. The factor μ is missing from the field (and both formulas are in Gaussian units, not SI units.)

279 First paragraph of Section 6.8: "Recall that later in Section 2.**8**, we used ..."

289 2nd equation on page: $\ln W = \ln N! - \sum_{j=1}^{M} \ln N_j = \ldots!$ (missing "ln" in first sum)

296 Last line of Example 5: "is a beta function (Section 3.**2**)."

Chapter 7

302 Equation (2) is not a dipole potential: the denominator should be $(x^2+...)^{3/2}$. The gradient of ∇V is calculated correctly from (2), but it is not a dipole field. For a correct dipole potential and field, see my note to page 271. The comments to Fig. 6.33 (p. 271) apply also to Fig. 7.2 – the figure is not consistent with the equations.

330 Problem 7: Equations are inconsistent, and Figure 7.32 does not correspond to the given equations. To make consistent, change last equation to $z(\theta,\varphi) = b \sin \varphi$, and in Figure 7.32(a) let a, b, θ, y be replaced by b, a, φ, z; in caption for (b), "rotating the above circle about the z axis."

335 3rd line after example: "diffusion equation (Equation **16** of Section 1.)"

336 Last paragraph: "for a charge-free region" (not "charged-free")

Chapter 8

376 Table 8.3: $h_\varphi = r \sin \theta$ (not $r \sin \varphi$)

378 Problem 19: "Show that $F(k) = 4\pi \int_0^\infty f(r) \frac{r \sin kr}{k} dr$." (Not triple integral, not $[-\infty, \infty]$, missing factor 4π.)

381 In Example 3, it is perhaps worth noting that "dV" in a 2-dimensional space is not a volume but an area.

384 Equations at top of page: delete extra $\mathbf{e}_z$ on the right of $\partial \mathbf{e}_r / \partial z$.

390 Equation (4): η missing from $h_\varphi = a \sinh \boldsymbol{\eta} \sin \theta$.

Chapter 9

442 Example 6. For the interval [-1,1], $|x| = -x$ for $x \le 0$, so the first determinant is $\begin{vmatrix} x & -x \\ 1 & -1 \end{vmatrix} = 0$ (not $-2x$) for $x \le 0$, and $W(x)=0$ everywhere for both parts of interval.

Chapter 10

460 (14) and last equation: For consistency with Section 9.7, should write $\langle \boldsymbol{u} \,|\, \boldsymbol{v} \rangle$, $\langle A\boldsymbol{u} \,|\, A\boldsymbol{v} \rangle, \langle \boldsymbol{u} \,|\, \boldsymbol{u} \rangle$.

461 After equation beginning with summation: "rows of A are orthonormal" (not "rows of $A^\dagger$ ...").

469 Line before Example 6: "... *mutually orthogonal eigen**vectors***" (not *eigenvalues*)

479 Line after Equation (25): first exponential factor in solution is $e^{-3\tau/8}$

503 Example 3: The last two equations should be written in terms of x' and y', not x and y.

Chapter 11

517 2nd line from bottom: "*in an interval* $x_0-h \le x \le x_0+h$ *lying within the region*"

520 Equation before Example 4: $F(x,y) = 2xy + 2x + A$ (not "$= A$")

535 Eq. (14): $y(x) = (c_1 + c_2 x + c_3 x^2 + ... + c_n x^{n-1}) e^{\alpha x}$ (last constant is c_n , not c_{n-1} .)

547 2 lines above (16): $\omega_0^2 = (4L/C - R^2)/(2L)^2$ (not " / 2 L")

556 In Equation (1): second term of sum should contain $y^{(n-1)}$ ($n-1^{\text{th}}$ derivative), not y^{n-1} .

559 Fig. 11.18 is not consistent with the given boundary condition that $y(0) = 1/\alpha$.

Chapter 12

579 End of Example 1 ("... the two power series do not seem to be expressable in terms of known functions.") The alert reader will note that the first (even) series gives $e^{-\frac{3}{2}x^2}$.

583 Equation (7) should not have the initial "4" if it is to agree with previous Eq. (11)

585 Equation (9): both limits should be as "$x \to x_0$".

595 After Equation (8), "... associated with this equation is $(r + 1)^2 = 0$"

596 Line 1: "... with $r = -1$ into Equation 8, ..." (not 7)

599 Before Eq. (26): "... corresponding to $r_1 = 0$ is (Problem **18**) ..." (not Problem 19)

609 Example 6 SOLUTION, first equation: last term is .. + $(gx/b^2)\theta = 0$

612 Equation (1): should have minus sign before the x^6 term

613 Equation (9): integral is missing "dx"

616 Before Eq. (21): "Using the result of Problem 19 of the ..." (not Problem 18)

619 Second equation on page: $\ldots + J_2(x)\,(t^2 + 1/t^2) + \ldots$ (+ sign, not −)

622 Problem 24: The second J inside the integral is $J_n(\beta_j)$.

Chapter 13

627 Line after (6): "Any point for which $\dot{x} = \dot{y} = 0$ is called a *critical point*."

629 2 lines before (17): "such as (π, 0)"

631 After Equation (20), $(\dot{x}^2 + x^2)$ should be replaced by $(\dot{x}^2 + \omega^2 x^2)$ in 3 places

Chapter 14

671 Figure 14.3: Charges are at $y = \pm l/2$ (not stated explicitly anywhere, but used in results.)

671 Expression for M_2 before Equation (18): each $ql^2/2$ should be $ql^2/4$

672 After Example 3: "The quantities M_n in Equation 16 are called *multipole moments*, ..." This is inconsistent with the very next sentence, since M_1 $(= \mu\cos\theta)$ is certainly not "the magnitude of the dipole moment μ". The usual nomenclature is that the multipole moments are the **coefficients** of $\frac{1}{4\pi\varepsilon_0}\frac{P_n(\cos\theta)}{r^{n+1}}$ in the expansion of $V(r,\theta)$

692 Example 2, last equation: $L_m(x)\,L_n(x)$ should be $L_m^{(\alpha)}(x)\,L_n^{(\alpha)}(x)$.

706 Eq. (20): First term should be $\left[\frac{dG}{dx}\right]_{z-\varepsilon}^{z+\varepsilon}$, not second derivative.

707 Eq. (22): missing "dx" in integral

Chapter 15

715 First equation of (10): right side should be multiplied by l (i.e. = $\delta_{nm}\,l$)

717 Second paragraph, line 3: "We'll see in Section **3** ..." (not 4)

731 Equation (6): upper limit of sum is N, not ∞.

732 Equation (11): factor a_n is missing from cosine term.

740 Equation (7): note that γ in this section has a different definition than in Section 11.3 Eq. (20).

742 Line 2: underdamped (not undamped)
Equation (14): $x_n(t) \approx \ldots$

743 4 lines before Example 3: "... or if ω_2 [not ω_3] is three times $\omega = 1$" – see Equation (10).

Chapter 16

748 Example 1: Solution, lines 1 and 2 should read $\nabla^2 T = \ldots = -3T, \quad \partial T/\partial t = -3\alpha^2 T$.

763 Example 3: "The final solution is ... $\frac{I_0(n\pi r/l)}{I_0(n\pi a/l)}$ ...".

768 The line after Equation (3): "...where $-\beta^2$ is the separation constant."

780 Equation (14): After the first equal sign, ν (nu) should be v (vee), the same as after the second equal sign.

781 In the second equation for $u(x,y,0)$, the sums begin with $n=1$, $m=1$ (not 0).

782 In the equation before (18), ∇^2 should be $\nabla^2 u$.

790 Line 2: $T_0 \sin^2 \pi x/l$

792 Example 3, last 5 lines: missing a factor of T_0 in the equations for c_n and $T(x,t)$.

797 Equation (6): $\frac{h^2}{8m}(...)$, not $\frac{\hbar^2}{8m}$

800 Last equation before Table 16.1: $... = \frac{2}{2n+1}\delta_{ln}$ (See Eq. 14.1.20)

807 Problem 15: Rodrigues formula (not Rodriguez)

817 Example 2: There should be no "$f(t)$" inside the first integral.

Chapter 17

840 Equation (4) should have $U(x,s)$ in both places.
Equation (8) should have $U(x,s)$.

843 Example 1: Line 2 of example and Line 3 of solutions should both have $u_t(x,0) = 0$ (instead of u_x)

846 Equation (5): should omit minus sign before i in exponent.
Text in italics near bottom uses x as the variable, instead of t as in equations. Should replace every x by t.

849 Example 2 SOLUTION, line 6: "The zeros of $F(\omega)$ occur at ... for $n = \pm1, \pm2, ...$" (**not** $n=0$, since lim (sin x / x) = 1.)

851 Equation (17): The last factor inside the first integral is e^{-iuk} (not e^{-iux}).

Chapter 18

875 Example 1 SOLUTION should begin $f'(z_0) = ...$

898 Example 4 solution should be $I_2 = ... = \pi i\,(7\cosh 1 - 4\sinh 1)$ (and also in last line)

903 2 lines before Equation (6): "... where $|(z-a)/(\zeta-a)| < 1$" (absolute value missing)

905 1 line after Equation (12): "... Laurent series with $b_n = 0$ ..." (not b_{-n})

914 The equation after Equation (6) should begin: $f(z) = \frac{g(a)}{(z-a)^N} + ...$ (not "$g(z) = ...$")

Incorrect Answers to selected problems
(there are many more, but I haven't kept track of them)

1128	Problem 4.6.2	"$+2\pi k$" is incorrect
1143	Problem 16.2.3	sinh term contains n and is inside the sum
1147	Problem 17.5.10	Exponent is $-2(ix + \|x\|)$