1 Errata for "Principles of Applied Mathematics; Transformation and Approximation", second edition

There are two lists here. In the first list are those errors that appear in the first printing but were corrected for the second printing. The second list are those errors that appear in both the first and second printing.

List 1: (Corrected for the second printing)

1. pg. 7; The law of cosines (line 15) should read

   $||x+y||^2 = ||x||^2 + 2||x|| \cdot ||y|| \cos\theta + ||y||^2$.

2. pg 12; line -3 of footnote. "vetor" should be "vector".

3. pg. 15 line 3; M lies in a k-dimensional space,

4. pg. 25 line 14; the null space is spanned by $(2, -1)^T$.

5. pg 35; Caption to figure 1.8; "rotations" should be "reflections".

6. pg. 49; Problem 1.3.c; n must be greater than 1.

7. pg. 65

   (a) line 17; property (3) should be property (4)

   (b) line 23; $\ldots = (||x|| + ||y||)^2$.

8. pg. 67, last line; components (delete "of")

9. pg 72

   (a) line -6; The coefficient for the scale factor for the Legendre polynomial should be 2^n rather than 2_n.

   (b) line -3 $\omega(x)$ should be $w(x)$.

10. pg 73

(a) lines 1, 4, 6, 8, 13; $\omega(x)$ should be $w(x)$.

(b) line 8, $w(x) = (1-x)^\alpha(1+x)^\beta$

(c) line 10, $p_n^{\alpha\beta}(x) = \frac{(-1)^n}{2^n n!}(1-x)^{-\alpha}(1+x)^{-\beta}\cdots$.

11. pg. 80, line 12; "basis functions" rather than "basis function".

12. pg. 93, line 15, Ingrid

13. pg. 94, Exercise 8. (a): Use property 5 ..., (b) Use property 6 ...

14. pg. 96, Exercise 8 e), $T_n(x) = \frac{(-1)^n 2^n}{(2n)!}(1-x^2)^{1/2}\cdots$.

15. pg. 109, line -11: In the string of (in)equalities, change $|<Lu, v>| = ||Lu|| \cdot ||v||$ to $\leq$ instead of $=$ (using the Schwartz inequality).

16. pg. 116, line -9; $K_n u$ rather than Ku

17. pg. 125, line -3; $I = \int_0^{\pi/2} 2d\theta = \pi$.

18. pg. 126,

    (a) line 6; Integrand is missing an r.

    (b) line 11; $g_r(r)$ should be $g_n(r)$

    (c) line 13; In denominator of integrand, $\sqrt{\rho^2 - x^2}$ should be $\sqrt{\rho^2 - z^2}$

    (d) line -1; This is not incorrect, although with the change of variables suggested, one finds $I_0 = \sqrt{a^2-b^2}\int_0^\pi \frac{d\theta}{a+b\cos\theta}$, which because of symmetry of $\cos\theta$ is the same as shown.

19. pg. 129, line 2; dy rather than dt

20. pg. 141, Example 1 should read $\langle H', \phi\rangle = -\int_0^\infty \phi'(x)dx = ...$

21. pg. 142, Example. As $n \to \infty$, ...

22. pg. 150, line 2: $a_2(x)h(x,x)f'(x)$... (i.e. lower case h)

23. pg. 155, line 3: $g^*(x,y)$ should be $g^*(y,x)$, and J should be J_y

24. pg. 164, line -9: $S_{n+1/2}(\xi - x)$ should be $S_{n+1/2}(2\pi(\xi - x))$

25. pg. 168, line 11; in definition of the Jacobi polynomials, $(01)^\alpha$ should be $(-1)^\alpha$

26. pg. 171, Problem 1a. second line of definition should be for $|x| \geq 1$.

27. pg. 175 Problem 4.3.9; $-\beta$ should be replaced by $= -\beta$

28. pg. 180 line -2 Replace $F + \lambda G$ by $F - \lambda G$ (twice)

29. pg. 213, Caption to Figure 6.2, $e^{(\theta_1 \theta_2)/2}$ replaced by $e^{i(\theta_1+\theta_2)/2}$.

30. pg. 215

    (a) line 11; $f(z) = u(x, y) + iv(x, y)$

    (b) line 17; $\frac{\partial v}{\partial z}$ should be $\frac{\partial v}{\partial x}$.

31. pg. 216

    (a) line 2, $\cdots = u_x(x_0, y_0) + \cdots$

    (b) line -1 should read $\frac{e^{z+\Delta z} - e^z}{\Delta z} = \cdots$

32. pg. 223 line -3 the denominator is missing a factor of r, and should be $1 - 2r\cos(\phi - \theta) + r^2$.

33. pg. 235, line -7: $\cdots = -2\pi i \rho A V$

34. pg. 242, line 7: ...with angle of attack α in the z-plane.

35. pg. 248, line -3; $\cdots = \left.\frac{2\pi i}{2(z+i)}\right|_{z=i} \cdots$

36. pg. 253, line -12; $I(R) = \int_{\Gamma(R)} e^{iaz} g(z) dz$.

37. pg. 254, line 13, $I = 2\pi i \left.\frac{e^{iaz}}{z+i}\right|_{z=i}$

38. pg. 259, line 6: $=$ should be $+$

39. pg. 276

    (a) Problem 6.2.9; The contour should be $|z| = 1$.

(b) Problem 6.3.5; The ranges for z should be strict inequalities, that is, Im $z < 0$ and Im $z > 0$.

40. pg. 286, line 15; $= \dots |_{\lambda=k^2\pi^2}$

41. pg. 298, line -8; $\dots = \frac{1}{n!}\frac{d^n}{dz^n}$

42. pg. 299, line -5 should begin $= \frac{1}{2\pi}\sum_{k=-\infty}^{\infty} \cdots$

43. pg. 308 line 4, singularities of $F(s)$ ...

44. pg. 309, line 6, becomes $Lu = -d^2u/dt^2 - \lambda u$

45. pg. 310, line -2; $(\Delta u)_n + \lambda u_n = 0$

46. pg. 311

    (a) line 13 $\lambda = 2 - \xi - 1/\xi$.

    (b) line -8; $\delta_{nj} = \frac{1}{2\pi i}\int_{C'} z^{|n-j|-1}dz$

47. pg. 314, line 2, "to be real" should be "to be nonzero and real".

48. pg. 316, last line; $R_R(k) = -R_L(-k)$ is not correct. The correct statement is $R_R(k)/T_R(k) = -R_L(-k)/T_L(-k)$ for real, nonzero k.

49. pg. 317, line 3: e^{ik_0} should be replaced by e^{ik_0x}.

50. pg. 328, last line, delete "α real".

51. pg. 330, Exercise 11. Reference should be to Theorem 7.3.

52. pg. 361, line 6 ...if and only if $J_n(\sqrt{\lambda}R) =$

53. pg. 363, (8.34) $\dots \left(\sin\phi \frac{\partial U_m}{\partial \phi}\right) \dots$

54. pg. 382, line -4 should read "$\nabla^2\phi_j = v_j$ in Ω and $\mathbf{n}\cdot\nabla\phi_j = 0$ on $\partial\Omega$, for $j = 1, 2$."

55. pg. 386, line -4; $u(R,t) = T_1$

56. pg. 396, line -1 insert "to" before solve.

57. pg. 408, last line should end with "?".

58. pg. 409, Problem 8.4.1, the equation should read $u_{n_t} = \frac{1}{h^2}(u_{n+1} - 2u_n + u_{n-1})$.

59. pg. 411, line 2: **scattering transform** should be **inverse scattering transform**. (However, the index was **not** changed.)

60. pg. 412

    (a) line 5; For reasons that are somewhat subtle, it is not sufficient to assume that $q(x)$ is absolutely integrable. Instead, one must make a stronger assumption, such as $\int_{-\infty}^{\infty}(1+|x|)|q(x)|dx < \infty$.

    (b) line -7, Im $k \geq 0$ should be Im $k > 0$.

61. pg. 426

    (a) line -12 $\frac{dq_n}{dt}$ should be replaced by $\frac{d^2q_n}{dt^2}$.

    (b) line -3 $\frac{dv_n}{dt}$ should be replaced by $\frac{d^2v_n}{dt^2}$.

62. pg. 441, line 3; In Table 10.1

63. pg. 444, line 6; $\Gamma(x+1) = \int_0^\infty e^{x\ln t - t}dt$ (corrects a sign error in the exponent).

64. pg. 463, prob 10.2.1; $E_n(x) = \int_1^\infty \frac{e^{-xt}}{t^n}dt$.

65. pg. 540, line 16; The equation for y should read $L^{-1}y_0'' - vy_0' - \frac{1}{\epsilon^2}y_0 f(\theta_0) = 0$

66. pg. 542, line 17 insert "(" (open parenthesis) before cardiac.

67. pg. 567, 1.1.2 should be 1.1.3.

68. pg. 568; The answer to 1.2.1 is not computed correctly. The matrices C and D are correct, but the representation of A should be

$$\begin{pmatrix} \frac{53}{6} & -\frac{19}{3} & -4 \\ \frac{13}{12} & -\frac{5}{6} & -1 \\ \frac{49}{4} & -\frac{17}{2} & -5 \end{pmatrix} \tag{1}$$

69. pg. 574

   (a) 3.4.2; Answer (a) is the correct answer for (b). Answer (b) is the correct answer for some other unrelated problem.

   (b) line -1: $a_n = \frac{2n+1}{2}$.

70. pg. 575, Problem 3.5.1c; $u(x) = f(x) + \int_0^x \sinh(x-t)f(t)dt$.

71. pg. 575, Problem 3.5.2; $u(x) = f(x) + \frac{\lambda}{1-\lambda} + \int_0^1 f(t)dt = x + \frac{\lambda}{2(1-\lambda)}$ when $f(x) = x$, provided $\lambda \neq 1$.

72. pg. 576

   (a) line 5: (answer to 4.1.6) $u(x) = \delta(x) + c_1 x + c_2$

   (b) line 18: (answer to 4.2.3) $g(x, y) = \frac{1}{2\alpha} \cdots$

   (c) line -9: (answer to 4.2.7) $u(x) = -\frac{1}{2\alpha} \cdots$.

   (d) line -6, (answer to 4.2.9) $u(x) = \int_0^1 g(x,y)f(y)dy - \lambda \int_0^1 g(x,y)u(y)dy + \cdots$

   (e) line -4,(answer to 4.2.10) $u(x) = \int_0^1 g(x,y)f(y)dy - \lambda \int_0^1 g(x,y)u(y)dy + \cdots$

   (f) line -2 (answer to 4.2.11): $u(x) = \int_0^1 g(x,y)f(y)dy - \lambda \int_0^1 g(x,y)u(y)dy + \cdots$

73. pg. 577

   (a) line 2 (answer to 4.2.13) $u(x) = \cos x + \lambda \int_0^x p(\xi)\sin(x-\xi)u(\xi)d\xi$

   (b) line 3 (answer to 4.2.14) $u(x) = 1 + \int_0^x \xi \ln(\frac{x}{\xi})u(\xi)d\xi$

   (c) line -1 (answer to 4.4.7) $\cdots - \frac{\pi}{3}(\alpha + \frac{\beta}{2})$.

74. pg. 580

   (a) Problem 6.1.3;

      (a) $z = \frac{\pi}{2} + 2n\pi - i\ln(2 \pm \sqrt{3})$.

      (b) $z = (2n+1)\pi - i\ln(\sqrt{2}+1), z = 2n\pi - i\ln(\sqrt{2}-1)$.

   (b) Problem 6.2.3; $\int_C z^{-1/3}dz = -3(2)^{1/3}e^{i\pi/6}$.

75. pg. 581, Problem 6.3.6; (b) $F_x - F_y = -8\rho\pi i A$. (c)$F_x - iF_y = \rho\pi(4\gamma A - 8A^2 i)$.

76. pg. 586

    (a) Problem 8.1.13; $u(r,\theta) = -\frac{2}{\pi}\int_0^\infty \dots$

    (b) Problem 8.1.14; $u(r,\theta) = \sum_{n=-\infty}^{\infty} a_n \dots$

77. pg. 589, Problem 10.2.2; $\sum_{k=0}^{\infty}(\frac{\pi}{x})^{2k}$.

78. pg. 593, problem 12.1.8; $\phi_\tau = \frac{1}{6}A^2$ instead of $\phi_\tau = \frac{1}{6}^2$.

Second list: Errors in both first and second printings.

1. pg. 8, line 19, $\gamma = \frac{\langle x,y\rangle}{||y||^2}$.

2. pg. 12, Example 2, Eigenvalues are $\lambda = \cos(\theta) \pm \sin(\theta)$.

3. pg. 27, line 3, $||Ax - b||^2$

4. pg. 37, eqn (1.12) First term should not be squared: $||Ax - b|| =$

5. pg. 39, line 11, $= \frac{\lambda_j}{\sqrt{\lambda_i}}\langle x_i, x_j\rangle = \sqrt{\lambda_j}\delta_{ij}$

6. pg. 40, line -11, $A^{-1} = \frac{1}{\sqrt{10}}\begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix}\begin{pmatrix} \frac{1}{\sqrt{10}} & 0 \\ 0 & \frac{1}{\epsilon} \end{pmatrix}\cdots$

7. pg. 43, line 12. The sequence defined by (1.16) converges as stated in Theorem 1.14 only if $\lambda_1 > 0$. If $\lambda_1 < 0$ or is complex, then the iterates must be normalized differently to get convergence. For example, one could use $x_{n+1} = A\frac{x_n}{s_n}$ where s_n is the element of the vector x_n having largest magnitude.

8. pg. 49, line -3 should read "normed linear vector space."

9. pg. 52 line -2; should read: and $A^*\psi = \overline{\lambda}\psi$

10. pg. 73, line 15; The normalization constant is not the same as in other places, such as Hochstadt, The Functions of Mathematical Physics, pg. 41.

11. pg. 77, eqn (2.16); $f_k = \frac{2}{n}\sum_{j=0}^{n-1}\cdots$

12. pg. 86, line 18; $= 2\phi(\cdots$

13. pg. 87, line 13; $\sum_q L_{pq}\cdots$

14. pg. 87, line 17; $+\sum_k f_k^j \sum_m \cdots$

15. pg. 88, line 13; $2^{k+1} - 2$

16. pg. 94, Problem 2.1.9 should be in Section 2.2.

17. pg. 96, Problem 11; $P_n(x) = \frac{(-1)^n}{2^n n!}\frac{d^n}{dx^n}(\cdots$.

18. pg. 111, line 12; $\sqrt{2}$ should be $\sqrt{2\pi}$.

19. pg. 117, line 6 $|\mu_n| = ...$

20. pg. 130, line 7 should read "provided $\lambda\mu_i \neq 1$ for $i = 1, 2, \ldots$."

21. pg. 132, Problem 3.7.2-a; Require $\alpha > 1$.

22. pg. 140, line 2 $\Delta_y = \delta_y'$

23. pg. 153, equations (4.13) and (4.14). $p(x)$ should be replaced by $-p(x)$.

24. pg. 184, line 7; $\ldots = \frac{d^{k-1}\eta}{dx^{k-1}}(x_0) = \frac{d^{k-1}\eta}{dx^{k-1}}(x_1) = 0$.

25. pg. 192, last line $\eta_x = 0$

26. pg. 206, line 13 $L = \frac{I_1}{2}(\dot{\theta}^2 + \dot{\phi}^2 \sin^2\theta) + \cdots$

27. pg. 211, line 14 should read $\ln z = \ln(re^{i\theta}) = \ln r + \ln(e^{i\theta}) = \ln r + i\theta$.

28. pg. 229, line -6; there is a missing "=" sign; $= \frac{\partial}{\partial x}\frac{\partial\phi}{\partial x} + \frac{\partial}{\partial y}\frac{\partial\phi}{\partial y} = \frac{\partial^2\phi}{\partial x^2} + \frac{\partial^2\phi}{\partial y^2} = 0,$

29. pg. 230, line -15; $\psi = -A\theta$

30. pg. 240, line -1; $\left(e^{i\alpha}\coth\frac{\pi e^{i\alpha}}{2z} + e^{-i\alpha}\tanh\frac{\pi e^{i\alpha}}{2z}\right)$

31. pg. 260, line -12, provided $|\mathrm{Re}z| < 1$.

32. pg. 271, eqn 6.40 $f(z) = \frac{1}{h}\int_{-\infty}^{\infty} f(t)\text{sinc}(\frac{z-t}{h})dt$

33. pg. 305, line -3, where $z = e^{i\mu/2}$.

34. pg. 307, last line $f(t) = \frac{1}{2\pi}\int \cdots$

35. pg. 308, line 3; $f(t) = \frac{1}{2\pi}\int \cdots$

36. pg. 320, line 3 $T = U_0 = \cdots$

37. pg. 320, eqn 7.33, $u_2(x) = e^{-ikx}$ for $x < 0$.

38. pg. 321, line 4, $u_2(x) = ae^{-ik_1x} + \cdots$ for $0 < x < \alpha$,

39. pg. 321 line 6, $x = 0, \alpha$

40. pg. 323 line 15, $v = u - 2(\ln w)''$ (delete "$)z = 0$").

41. pg. 323, eqn 7.37 $\cdots - \beta \cdots$.

42. pg. 323, line 22 $\cdots - \beta \cdots$

43. pg. 373, Exercise 7.1.27 $\ldots \left(\sin\phi\frac{\partial u}{\partial\phi}\right)\ldots$

44. pg. 441 line -7, $\gamma(a, x) = \cdots =$ stuff with x^{n+a}

45. pg. 483, line 7. $a = GM/h^2c^c$.

46. pg. 483, line 18, c is the speed of light. (not c^2)

47. pg. 509, eqn (12.7) should be

$$u(t) = \rho_0\left(\frac{a}{(a-\rho_0^2)e^{-\epsilon at} + \rho_0^2}\right)^{1/2}\cos(t+\phi_0) + O(\epsilon) \quad (2)$$

48. pg. 515 line -4; $u(x) = U_0(y) + \epsilon u_1(y,\sigma) + \epsilon^2 u_2(y,\sigma) + \cdots$,

49. pg. 526, line 13, should read ... $p_1 + p_2 + p_3 = 1$

50. pg. 540, line -14, for all θ with $0 \le \theta < 1$,

51. pg. 567 line 12, 13 should read "approaches 4 as p goes to infinity"

52. pg. 574, Problem 2.2.26,d) should have $a_{ij} = \int_0^1 \psi_i(x)\psi_j(x)dx$,

53. pg. 574, Problem 3.1.1, $u(x) = \int_0^x \cdots$.

54. pg. 574, Problem 3.4.1-b) should be $f(x) = \frac{2}{\pi^2} \cdots$.

55. pg. 576, Problem 4.1.9, $\delta(x^2 - a^2) = \frac{1}{2|a|}(\delta(x-a) + \delta(x+a))$.

56. pg. 576, Problem 4.2.7; $u(x) = -\frac{1}{2\alpha} \cdots$

57. pg. 577, Problem 4.4.2; $g(x, y) = (3y^2 - 2y^3)(x - \frac{1}{2}) + \frac{1}{2}y - \frac{1}{2}x - \frac{1}{2}x^2 + (y - x)H(y - x)$.

58. pg. 580, 6.2.5; These answers are total nonsense.

59. pg. 593, 12.1.4; $A(\tau) = \frac{2A_0}{\sqrt{3A_0^2\tau+4}}$.

60. pg. 601, line 3, column 2, “Reisz” should be “Riesz”.

Feel free to let me know about any other errors you may find. I’ll add them to this list.