Errata in the Published Version

August 10, 2008

- the page before cover page "dicussed" should be "discussed".
- page 7, after (1.2.19) "Theorem 1.2.6" should be "Theorem 1.2.7".
- page 10, line 1, in (1.3.28) "$zI_\nu(z)$" should be "$zI'_\nu(z)$".
- page 13, above (1.4.11), "ζ" should c.
- page 19 two lines below (2.1.10), "$j = n, n-1, \ldots, 1$" should be "$j = n-1, n-2, \ldots, 1$".
- page 23 last line "Theorem 2.2.3" should be "Theorem 2.2.2".
- page 34, 4 lines below (2.5.12), "$(e_0 dE_\lambda e_0)$' should be "$(e_0, dE_\lambda\, e_0)$.
- page 38, line 7 "the zero of" should be "the zeros of".
- page 39, the last line in the determinant in (2.7.8) replace "$P_{n+1}(x)$" by "$P_{n-k+1}(x)$" .
- page 53 2 lines below (3.1.11) "$-e \ln|x-c|$ " should be "$-2e \ln|x-c|$".
- page 54, line 2, "differential' should be "differentiable".
- Page 60, In (3.28) and (3.29), replace b_n by α_n.
- page 66 in (3.3.20) ϕ should be ϕ_n.
- page 70, line 2, replace γ_n in "$(-1)^n P_n^{(\alpha,\beta)}(1) P_n^{(\alpha,\beta)}(-1)/\gamma_n$" by γ_n^2 to read "$(-1)^n P_n^{(\alpha,\beta)}(1) P_n^{(\alpha,\beta)}(-1)/\gamma_n^2$".
- page 84, in (4.2.10) all the superscripts "(α, α)" should be "(α, β)".
- page 94 line 3 in §4.5 "$P_n^{(\nu-1/2, v-1/2)}(x)$" should be "$P_n^{(\nu-1/2,\nu-1/2)}(x)$".

- page 96, line 2 "C_n^{ν}" should be "$C_n^{\nu}(x)$".
- page 99 in (4.6.2) "$\Gamma(a+n+1)$" should be "$\Gamma(\alpha+n+1)$".
- page 105 in (4.6.39) "$J_{\nu+\nu+1}$" should be "$J_{\mu+\nu+1}$".
- page 112, line 1, "possibility" should be "positivity".
- page 114, line 2 "$\sum$" should be "$\sum_{n=0}^{\infty}$".
- page 116 in (4.8.3) "$(z/2)^{-\nu}$" should be "$(y/2)^{-\nu}$".
- page 116, above (4.8.5), "Rodriguez" should be "Rodrigues".
- page 118, line 2 in Theorem 4.8.13 replace "n^{-p} by "n^{-1}".
- page 122, line 1, "decreases" should be "decrease".
- page 123, in (4.10.3) replace "$(2z+1)$" by '$2(z+1)$".
- page 125, (4.10.14), "Rodriguez" should be "Rodrigues".
- page 130, Exercise 4.3 "$(x+1)$" should be "$(n+1)$".
- page 130, Exercise 4.7 insert "${}_1F_1(-k;\nu+n+1-2k;1)$" in the second part before $C_{n-2k}^{\nu}(x)$".
- page 131, Exercise 4.13, replace "$H_{n-2k}(x)$" by "$\frac{H_{n-2k}(x)}{(n-2k)!}$".
- page 132, in Exercise 4.18, the last term should be

$$-\frac{2n(n+1)}{(2n+\alpha+\beta+1)_2}\,P_{n+1}^{(\alpha,\beta)}(x)$$

- page 134 two lines above (5..1.8) "Theorem 1.2.3" should be "Theorem 1.2.4"
- page 134 two lines below (5..1.8) t^n should be $\frac{t^n}{\rho_1^n}$.
- page 136, in (5.2.4) and (5.2.5): "$p_{m,n-1}$" should be "$p_{m,n-1}(t)$", "$p_{m,n+1}$", should be "$p_{m,n+1}(t)$", "$p_{m+1,n}$" should be "$p_{m+1,n}(t)$", "$p_{m-1,n}$" should be "$p_{m-1,n}(t)$".
- page 136 in (5.2.5) "$\lambda_n+\mu_n$" should be "$\lambda_m+\mu_m$".
- page 137 2 lines above(5.2.11) "actor" should be "factor".

- page 144 below 5.3.17, $\mathbb{C} - [-1,1]$" should be $\mathbb{C} \setminus [-1,1]$".
- page 163 below (5.7.9), "$P_n^{(\alpha,\beta)}(x)$" should be "$P_n^{(\alpha,\beta)}(x;c)$".
- page 165 in (5.7.19), insert x after "$\frac{(1+\gamma)(\gamma+2c)_2}{2(c+1)(\gamma+c)}$" to read "$\frac{(1+\gamma)(\gamma+2c)_2}{2(c+1)(\gamma+c)}x$".
- page 172 above (5.9.6), "asymptotoc" should be "asymptotic".
- page 176 above (6.1.14), "(6.1.14)" should be "(6.1.13)".
- page 182, last line change "parameter" to "parameter and $[\sum_0^\infty a_n t^n]_N$ means $\sum_0^N a_n t^n$".
- page 183, in the right side of (6.2.41) change "$\binom{N-n}{x}$" to "$\binom{N+1}{x}$".
- page 196 below (6.5.11) "$J_\nu(x) \neq 0$" should be "$J_{\nu-1}(x) \neq 0$".
- page 196 3 lines below (6.5.11), "Theorem 6.5.5" should be "formula (6.5.11)".
- page 196 6 lines below (6.5.11), "gave explicit formulas for the polynomials $R_{n,-1/2}(z)$ and $R_{n,1/2}(z)$ from which he established Hurwitz's theorem in the cases $\nu = 1/2, 3/2$" should be "gave explicit formulas for the polynomials $R_{n,1/2}(z)$ and $R_{n,3/2}(z)$ from which he established Hurwitz's theorem in the cases $\nu = -1/2, 1/2$".
- page 202 lines below (6.6.16), Before "A similar analysis ..." insert "The results of this section are from (Ismail& Zhang, 1994." The last sentence should be "The details are in Ismail, Rahman & Zhang, 1996.".
- page 206 formula (7.2.2) $\alpha_j \alpha_j - 1$ should be $\alpha_j \alpha_{j-1}$.
- page 222, line 3 in the introduction "polynomial" should be "polynomials".
- page 223, at the end of (8.1.10), change "," to ".".
- page 226 in (8.2.9), "$\overline{\alpha}_n$" should be "$-\overline{\alpha_n}$"
- page 231, insert at the end of §8.2:
  One can also show that the zeros of ϕ_n lie in the open unit disk as follows. Let $\phi_n(z_0) = 0$, so that $\Phi_n(z) = (z - z_0)P(z)$ and P is of exact

degree $n-1$. Now P is orthogonal to Φ_n and $zP(z) = \Phi_n(z) + z_0 P(z)$ imply

$$\int_{-\pi}^{\pi} |P(z)|^2 d\mu(\theta) = \int_{-\pi}^{\pi} |zP(z)|^2 d\mu(\theta)$$
$$= \int_{-\pi}^{\pi} |\Phi_n(z)|^2 d\mu(\theta) + |z_0|^2 \int_{-\pi}^{\pi} |zP(z)|^2 d\mu(\theta).$$

Therefore

$$(1 - |z_0|^2) \int_{-\pi}^{\pi} |P(z)|^2 d\mu(\theta) > 0,$$

and the result follows.

- page 245, 3 lines above Theorem 8.5.1, "Nikadym" should be "Nikodym".
- page 245 the line above (8.5.1), "There, for $\zeta = re^{i\theta}$" should be "For $\zeta = re^{i\theta}$ we have"
- page 245 In (8.5.3), $\sum_{n=0}^{\infty}$ should be $\sum_{n=1}^{\infty}$.
- page 246, three lines above Theorem 8.5.4 replace "$\frac{1}{2n}$" by "$\frac{1}{2\pi}$".
- page 252, Exercise 8.2, line 2, "then" should be "Then".
- page 252, Replace "$h(z)$" by "$\exp(h(z))$" in Problem 8.3.
- page 254 equation (9.0.7) should read

$$w(x; \mathbf{b}) P_k(x; \mathbf{b}) \sim \sum_{n=k}^{\infty} c_{n,k}(\mathbf{b}, \mathbf{a}) \frac{\zeta(\mathbf{b})}{\zeta(\mathbf{a})} P_n(x; \mathbf{a}) w(x; \mathbf{a}). \qquad (9.0.7)$$

- page 267 last line in (9.3.14) "β_m" should be "β_n".
- page 275 in (9.5.9) "$d\mu_{\alpha,\beta} = (r, \phi) :=$" should be "$d\mu_{\alpha,\beta}(r, \phi) :=$"
- page 294 in (11.2.4), replace "$\sqrt{\xi_n}$" by "$\sqrt{\zeta_n}$".
- page 316 Exercise 12.2(a) "$e_q(\lambda D_q)$" should be "$e_q(\lambda(1-q)D_q)$"
- page 317, Exercise 12.3 (a) "$e_q(D_q)$" should be "$e_q((1-q)D_q)$".
- page 317 Towards the end of Exercise 12.3, "$e^{in\theta} H_n(e^{-2i\theta})$" should be "$e^{in\theta} h_n(e^{-2i\theta})$".

- page 319, 3 lines below (13.1.6), change "(14.1.6)" to "(13.1.6)". The following line, change "(14.1.1)" to "(13.1.1)".

- page 323 line 6 from the bottom "$H_n(\cos\vartheta|q)$" should be "$H_n(\cos\theta|q)$".

- page 326, in (13.1.33) replace "$H_n(x\sqrt{2/(1-q)}|q)$" by "$H_n(x\sqrt{(1-q)/2}|q)$".

- page 328, in (13.2.10) "$\sum_{n=1}^{\infty}$" should be "$\sum_{n=0}^{\infty}$"

- page 328 one line below (13.2.10) replace "(15.5.2)" by "(13.2.10)".

- page 331, 7 lines from the bottom, replace "use n replace" should be "replace n".

- page 334 4 lines below (13.4.2) "$t = e^{i\theta}$" should be "$t = e^{-i\theta}$".
  1 line below, in the displayed equation "$(1 - te^{-i\theta})$" should be "$(1 - te^{i\theta})$".
  2 lines above (13.4.3), $e^{-in\theta}$ should be $e^{in\theta}$
  2 lines below (13.4.3), the displayed expression should be

$$\frac{(\beta, \beta e^{-2i\theta}; q)_\infty}{(1 - te^{i\theta})(q, e^{-2i\theta}; q)_\infty} + \frac{(\beta, \beta e^{2i\theta}; q)_\infty}{(1 - te^{-i\theta})(q, e^{2i\theta}; q)_\infty}$$

- page 342 at the end of (13.6.14), "," should be ".".

- page 344 Insert x in the denominators of the middle and right side of equation (13.6.21) to read

$$= \frac{F\left(bq/x^2; aq\right)}{xF\left(b/x^2; a\right)} = (1 + a)\,\frac{G\left(b/ax^2; aq\right)}{xG\left(b/ax^2; a\right)}.$$

- page 346 2 lines above (13.7.17) "(13.7.13)" should be '(13.7.12)". Also 1 line below (13.7.17) "(13.1.17)" should be '(13.7.17)".

- page 347 above (13.7.31) "$Q_n^{(\alpha)}$" should be "$\theta_n^{(\alpha)}$".

- page 348 In the right-hand side of the first unnumbered equation in Exercise 13.2, "C_n" should be "C_{n+2k}".

- page 349, Problem 13.9 replace "(16.4.2)" with "(6.4.2)".

- page 375 in (14.8.1) replace "p_{n-k}" by "$p_{n-k}(y)$". The definition ends with (14.8.1), so change the font in "The model $\cdots$ till just before Theorem 14.8.1" from italic to Roman

- page 377 above (15.1.1) "polynomials special" should be "polynomials is the special".
- page 381 last sentence in §15.1, "Exercise 15.2" should be "Exercise 15.12".
- page 383 in (15.2.4) insert "$= h_n(\mathbf{t})\delta_{m,n}$" before the "=" sign".
- page 390 in (15.4.5) "$\sum_1^\infty$" should be "$\sum_0^\infty$".
- page 399, line 3, "is that it that" should be "is that".
- page 403 In the denominator the first line of (15.7.25), change "$qe^{-2i\theta}$" to "$e^{-2i\theta}$".
- page 424, in Problem 15.12 "$\lim_{q\to 1^-} p_n\left(2+x(1-q);q^{(\alpha+1)/2},q^{(\alpha+1)/2}\right)$" should be "$\lim_{q\to 1^-} p_n\left(1-x(1-q)/2;q^{(\alpha+1)/2},q^{(\alpha+1)/2}|q\right)$".
- page 443 in line 1 before "Apply" insert "Let $I(a_1,a_2,a_3,a_4)$ denote the integral in (15.2.1)."
- page 443 below (16.4.3) ???
- page 456, throughout Chapter 17, "$\mathcal{D}_{q,x}$" should be "$D_{q,x}$" and "$\mathcal{D}_q$" should be D_q.
- page 456, line 9, "(12.1.12)" should be "(11.4.1)".
- page 475 the sums "$\sum_{n=1}^\infty$" in (18.3.1), (18.3.2), and (18.3.3) should be "$\sum_{n=0}^\infty$".
- page 478 below (18.4.10) "q-Jacobi are" should be "q-Jacobi polynomials are"
- page 478 in (18.4.13), "$(aq)^k$" should be "$(\alpha q)^k$" and "$\delta_{m,n}$" should be "$(\alpha q)^n\,\delta_{m,n}$".
- page 479 in equation (18.4.15) change "$C_n\phi_{n+1}$" to "$C_n\phi_{n-1}$"
- page 479 Replace the material between "Apply the Chu-Vandemonde theorem to obtain" and "Theorem 18.4.1" by

$$\begin{aligned}\varphi_n(1,a,t_1,t_2) &= {}_2\phi_1\left(q^{-n},at_1t_2q^{n-1};at_1;q,q\right)=\left(q^{1-n}/t_2;q\right)_n\frac{\left(at_1t_2q^{n-1}\right)^n}{(at_1;q)_n}\\ &=(-1)^n(t_2;q)_n(at_1/)^n\,q^{n(n-1)/2}/(at_1;q)_n.\end{aligned}$$

Use the above evaluation at $x = 1$ in (18.4.15) and use (18.4.16) to obtain

$$(18.4.19) \quad C_n = -\frac{at_1^2 q^{n-1}\left(1-q^n\right)\left(1-t_2q^{n-1}\right)\left(1-at_2q^{n-1}\right)}{\left(1-at_1t_2q^{2n-1}\right)\left(1-at_1t_2q^{2n-2}\right)}.$$

- page 481 In Theorem 8.4.3 "(18.4.15)" should be "(18.4.25)".
- page 481, In the left-hand sides of (18.4.29) and (18.4.30) "$\varphi_n(x;t_1,t_2,a)$" should be "$\varphi_n(x;a,t_1,t_2)$".
- page 486 line 6, "$b_n - 1$" should be "b_{n-1}"
- page 510, line 1, "Schrodinger" should be "symmetric".
- page 510, 5 lines above (2,1,4), "orthoghonal" should be "orthogonal".
- page 511, in (20.1.7), change "$h(x)$" to "$h(x)y_n(x)$"
- page 550 in (21.7.5) "$q^{j(n+1)}$" should be "$q^{j(n+(j+1)/2)}$"
- page 551 in lines 2 and 3 from the bottom, delete the square brackets.
- page 552 line 5, "$q^{\frac{n^2}{2}-\frac{1}{2}}$" should be '$q^{-\frac{n^2}{2}-\frac{1}{2}}$"
- page 570 in (21.9.55), "(m$(u,0)$)" should be "cm$(u,0)$"
- page 649, last line, replace "$q^{-n/2}\alpha_n$" by "$q^{n/2}\alpha_n$"
- page 663 Annaby and Mansour (2005b) appeared in volume 38, pages 3775–3797.
- page 664 Askey (2005) appeared in Advances in analysis, World Sci. Publ., Hackensack, NJ, 2005, 1–16.
- page 668 "Burchnal, J. L & Chaundy" should be "Burchnall, J. L & Chaundy"
- page 672 line 13 from below "G. F. Tricomi" should be "F. G. Tricomi"
- page 676 in Heller's reference "Phys. Rev 22" should be "Phys. Rev A 12"
- page 690, "J. Shohat" should be "J. A. Shohat".

- page 694 in Wang and Wong (2005c), "stieltjes-wigers" should be "Stieltjes-Wigert". The reference is: J. Math. Pures et Appl. **85** (2006), 698–718.

Updates

- page 167, formula (5.7.26) is the same as (5.7.17).

- Theorem 4.7.11 is due to Robert Griffiths. The reference is
  R. C. Griffiths, The canonical correlation coefficients of bivariate gamma distributions, Ann. Math. Sat. 40 (1968), 1401–1408.

- page 561, in the material following Theorem 21.8.6, an error was found in results of Wang and Wong. We must delete the material on page 562 starting from "The Wang–Wong expansion ..." until the end of the section.

- **Conjecture 24.3.2** has been proved. In fact it turned out the the factor $(1-t_1-t_2-t_3-t_4)^{-1}$ is not needed. In other words, if

$$\left[\sum_{1\le i<j\le 4}(1-t_i)(1-t_j)\right]^{-1} = \sum_{k,\ell,m,n=0}^{\infty} G(k,\ell,m,n)t_1^k t_2^\ell t_3^m t_4^n$$

  then $G(k,\ell,m,n \ge 0$.

- **Conjecture 24.4.4**: Christian Berg proved that the functions A, B, C, D have the same q-order. Walter Hayman proved that the q-Phragmén-Lindeloff order is always a constant.

- **Conjecture 24.4.4**: A relevant reference is:
  L. Kherji, An introduction to the H_q-semiclassical orthogonal polynomials, Methods and Applications of Analysis **10** (2003), 387–412.