

Errata for *Mathematics handbook*, 6th edition, 1st printing

CHAPTER 5 – ELEMENTARY FUNCTIONS

Table on page 119. Incorrect signs in the inverse function column.

Function	Domain	Range	Inverse function	Derivative	Antiderivative
$y = f(x)$	D_f	R_f	$x = f^{-1}(y)$	$f'(x)$	$\int f(x) dx$
$y = \cosh x$	all x	$y \geq 1$	$x = \text{arcosh } y$ $= \ln(y + \sqrt{y^2 - 1})$	$(x \geq 0) \sinh x$	$\sinh x$
$y = \coth x$	$x \neq 0$	$ y > 1$	$x = \text{arcoth } y$ $= \frac{1}{2} \ln \frac{y+1}{y-1}$	$-\frac{1}{\sinh^2 x}$	$\ln \sinh x $

Table on page 125 (two square roots are not extended correctly)

	$\sinh x$	$\cosh x$	$\tanh x$	$\coth x$
$\sinh x =$		$\pm \sqrt{\cosh^2 x - 1}$	$\frac{\tanh x}{\sqrt{1 - \tanh^2 x}}$	$\pm \frac{1}{\sqrt{\coth^2 x - 1}}$
$\cosh x =$	$\sqrt{1 + \sinh^2 x}$		$\frac{1}{\sqrt{1 - \tanh^2 x}}$	$\frac{ \coth x }{\sqrt{\coth^2 x - 1}}$
$\tanh x =$	$\frac{\sinh x}{\sqrt{1 + \sinh^2 x}}$	$\pm \frac{\sqrt{\cosh^2 x - 1}}{\cosh x}$		$\frac{1}{\coth x}$
$\coth x =$	$\frac{\sqrt{1 + \sinh^2 x}}{\sinh x}$	$\pm \frac{\cosh x}{\sqrt{\cosh^2 x - 1}}$	$\frac{1}{\tanh x}$	

p. 131 formula for $\arctan \frac{1}{x}$ should read

$$\arctan \frac{1}{x} = \begin{cases} \frac{\pi}{2} - \arctan x, & x > 0 \\ -\frac{\pi}{2} - \arctan x, & x < 0, \end{cases}$$

CHAPTER 6 – DIFFERENTIAL CALCULUS

p. 139 Table 6.3.5, The derivative of $\frac{1}{x^2}$ should read $-\frac{2}{x^3}$.

p. 141 Jensen's inequality. The condition should read $\lambda_1 + \dots + \lambda_n = 1$, $\lambda_i > 0$

CHAPTER 7 – INTEGRAL CALCULUS

p. 146 F9 should read $= \frac{x^{n+1}}{n+1} \arctan x - \frac{1}{n+1} \int \frac{x^{n+1}}{1+x^2} dx$.

p. 157 Item 65 should read

$$A_n = \int \frac{dx}{(a^2 x^2 + c^2)^n} = \frac{x}{2(n-1)c^2(a^2 x^2 + c^2)^{n-1}} + \frac{2n-3}{2(n-1)c^2} A_{n-1}$$

p. 161 Item 130 should read

$$\int \frac{x^2}{(c^2 - a^2 x^2)^n} dx = \frac{x}{2(n-1)a^2(c^2 - a^2 x^2)^{n-1}} - \frac{1}{2(n-1)a^2} C_{n-1}$$

p. 161 Item 136 should read

$$\int \frac{x}{(px+q)(c^2-a^2x^2)} dx = \frac{1}{c^2p^2-a^2q^2} \left(-\frac{q}{2} \ln \frac{(px+q)^2}{|c^2-a^2x^2|} - \frac{cp}{2a} \ln \left| \frac{c-ax}{c+ax} \right| \right)$$

p. 163 Item 169 should read

$$\int \frac{dx}{x^2(ax^2+bx+c)} = \frac{b}{2c^2} \ln \left| \frac{ax^2+bx+c}{x^2} \right| - \frac{1}{cx} + \left(\frac{b^2}{2c^2} - \frac{a}{c} \right) \int \frac{dx}{ax^2+bx+c}$$

p. 166 Item 208 should read

$$\int \cos^3 ax dx = \frac{1}{a} \sin ax - \frac{1}{3a} \sin^3 ax$$

p. 167 Item 236 should read

$$\int \frac{dx}{\cos^n ax} = \frac{\sin ax}{a(n-1)\cos^{n-1} ax} + \frac{n-2}{n-1} \int \frac{dx}{\cos^{n-2} ax}$$

p. 168 Item 243 should read

$$\int \frac{x}{\sin^2 ax} dx = -\frac{x}{a} \cot ax + \frac{1}{a^2} \ln |\sin ax|$$

p. 170 Item 284 should read

$$\int \tan^2 ax dx = \frac{1}{a} \tan ax - x$$

p. 170 Item 285 should read

$$\int \tan^3 ax dx = \frac{1}{2a} \tan^2 ax + \frac{1}{a} \ln |\cos ax|$$

p. 177 In item 41, there is missing space which makes the line hard to read

$$\int_0^\infty e^{-ax^2} dx = \frac{1}{2} \sqrt{\frac{\pi}{a}} \quad \int_{-\infty}^\infty e^{2bx-ax^2} dx = \sqrt{\frac{\pi}{a}} e^{b^2/a} \quad (a > 0)$$

p. 178 Item 50 should read

$$\int_0^1 \frac{\ln x}{x-1} dx = \frac{\pi^2}{6}$$

p. 178 Item 56 should read

$$\int_0^{\pi/4} \ln(1+\tan x) dx = \frac{\pi}{8} \ln 2$$

CHAPTER 8 – SEQUENCES AND SERIES

p. 189 Item 12 should read

$$\sum_{k=1}^n k^m = \frac{n^{m+1}}{m+1} + \frac{n^m}{2} + \frac{1}{2} \binom{m}{1} B_2 n^{m-1} + \frac{1}{4} \binom{m}{3} B_4 n^{m-3} + \frac{1}{6} \binom{m}{5} B_6 n^{m-5} + \dots$$

p. 192 The power series expansion of $\tanh x$ should read

$$x - \frac{x^3}{3} + \frac{2x^5}{15} - \frac{17x^7}{315} + \dots + \frac{2^{2n}(2^{2n}-1)}{(2n)!} B_{2n} x^{2n-1} + \dots$$

p. 192 The power series expansion of $\cot x$ should read

$$\frac{1}{x} - \frac{x}{3} - \frac{x^3}{45} - \frac{2x^5}{945} - \dots + (-1)^n \frac{2^{2n}}{(2n)!} B_{2n} x^{2n-1} + \dots$$

CHAPTER 9 – ORDINARY DIFFERENTIAL EQUATIONS

p. 199 Item 2 should read: ... gives $p \frac{dp}{dy} - f(y, p) = 0, \dots$

p. 199 Item 5, equation (i) should read:

$$\frac{1}{r_1 - r_2} \left[e^{r_1 x} \int e^{-r_1 x} R(x) dx - e^{r_2 x} \int e^{-r_2 x} R(x) dx \right]$$

p. 199 Item 6, equation should read:

$$\frac{d^2y}{dt^2} + (a-1)\frac{dy}{dt} + by = R(e^t),$$

p. 200 First two lines should read

Condition	Particular solution $y_p(x) =$
$b \neq 0$	$\frac{1}{b} \left[P(x) - \frac{a}{b} P'(x) + \frac{a^2 - b}{b^2} P''(x) + \dots \right. \\ \left. + (-1)^n \frac{a^n - \binom{n-1}{1} a^{n-2} b + \binom{n-2}{2} a^{n-4} b^2 - \dots}{b^n} P^{(n)}(x) \right]$
$a \neq 0, b = 0$	$\frac{1}{a} \left[\int P(x) dx - \frac{P(x)}{a} + \frac{P'(x)}{a^2} - \dots + (-1)^n \frac{P^{(n-1)}(x)}{a^n} \right]$

p. 212 $D\mathbf{f}(\mathbf{x}) = \begin{bmatrix} a - by & -bx \\ dy & -c + dy \end{bmatrix}$ should be $D\mathbf{f}(\mathbf{x}) = \begin{bmatrix} a - by & -bx \\ dy & -c + dx \end{bmatrix}$

CHAPTER 10 – MULTIDIMENSIONAL CALCULUS

p. 221 Item 7 should read $\left| |\mathbf{x}| - |\mathbf{y}| \right| \leq |\mathbf{x} + \mathbf{y}| \leq |\mathbf{x}| + |\mathbf{y}|.$

CHAPTER 11 – VECTOR CALCULUS

p. 248 Table on top of the page, radius of curvature should read:

$$\text{Radius of curvature} \quad \rho_\kappa = \frac{1}{\kappa} \quad \rho_\kappa = \frac{1}{\kappa}$$

p. 253 Fourth formula from the bottom should read:

$$\text{grad } u = \nabla u = \frac{\partial u}{\partial r} \mathbf{e}_r + \frac{1}{r} \frac{\partial u}{\partial \theta} \mathbf{e}_\theta + \frac{1}{r \sin \theta} \frac{\partial u}{\partial \varphi} \mathbf{e}_\varphi.$$

CHAPTER 12 – ORTHOGONAL SERIES AND SPECIAL FUNCTIONS

p. 263 First equation on top of page should read

$$\begin{cases} -\frac{d}{dx} \{p(x)\varphi'(x)\} + q(x)\varphi(x) = \lambda w(x)\varphi(x), \\ A\varphi'(a) - B\varphi(a) = 0, \\ C\varphi'(b) + D\varphi(b) = 0. \end{cases}$$

p. 265 Recurrence formulas, second equation should read

$$(x^2 - 1)P'_n(x) = nxP_n(x) - nP_{n-1}(x)$$

p. 267 Top of page, formula for c_n should read

$$c_n = \frac{2n+1}{2} \cdot \frac{(n-m)!}{(n+m)!} \int_{-1}^1 f(x)P_n^m(x) dx.$$

p. 267 Recurrence formulas for Chebyshev's polynomials should read

$$\begin{aligned} T_{n+1}(x) &= 2xT_n(x) - T_{n-1}(x), & U_{n+1}(x) &= 2xU_n(x) - U_{n-1}(x), \\ T_n(x) &= U_n(x) - xU_{n-1}(x), & (1-x^2)U_{n-1}(x) &= xT_n(x) - T_{n+1}(x). \end{aligned}$$

p. 271 Generating function for Laguerre's polynomials should read

$$(1-t)^{-\alpha-1} \exp\left(-\frac{xt}{1-t}\right) = \sum_{n=0}^{\infty} L_n^{(\alpha)}(x)t^n, \quad |t| < 1.$$

p. 276 Generation function, first equation should read

$$\exp\left[\frac{x}{2}\left(t - \frac{1}{t}\right)\right] = \sum_{-\infty}^{\infty} J_n(x)t^n, \quad e^{ix \sin \varphi} = \sum_{-\infty}^{\infty} J_n(x)e^{in\varphi},$$

p. 276 Recurrence formulas, third equation should read

$$\frac{d}{dx}\left(x^p C_p(x)\right) = x^p C_{p-1}(x), \quad \frac{d}{dx}\left(x^{-p} C_p(x)\right) = -x^{-p} C_{p+1}(x),$$

p. 277 Top of page, second equation should read

$$K_{n+1}(x) = K_{n-1}(x) + \frac{2n}{x} K_n(x) = -2K'_n(x) - K_{n-1}(x).$$

p. 278 Item (iii), formula for c_0 should read

$$c_0 = \frac{2p+2}{a^{2p+2}} \int_0^a f(x)x^{p+1} dx$$

p. 291 Elliptic integrals of the third kind should read

$$\begin{aligned} \pi(k, n, \varphi) &= \int_0^\varphi \frac{d\theta}{(1+n \sin^2 \theta) \sqrt{1-k^2 \sin^2 \theta}} \\ &= \int_0^x \frac{dt}{(1+nt^2) \sqrt{(1-t^2)(1-k^2 t^2)}} \quad (k^2 < 1, \quad x = \sin \varphi) \end{aligned}$$

CHAPTER 13 – TRANSFORMS

p. 316 Item (6), defining interval for $f(t)$ should be $-L < t < L$.

p. 318 Item (27), defining interval for $f(t)$ should be $-\frac{\pi}{2} < t < \frac{\pi}{2}$.

p. 319–321 Table of Fourier transforms

$f(t)$	$F(\omega) = \hat{f}(\omega)$
F5. $f(-t)$	$F(-\omega)$
F7. $f(t-T)$ (T real)	$e^{-i\omega T} F(\omega)$
F41b. $\frac{1}{t^2 + a^2}$	$\frac{\pi}{a} e^{-a \omega }$
F45. $e^{i\Omega t}$	$2\pi\delta(\omega - \Omega)$
F50. $\theta(t+a) - \theta(t-a)$ $= \begin{cases} 1, & t < a \\ 0, & t > a \end{cases}$	$\frac{2 \sin a\omega}{\omega}$
F53. $\frac{\sin \Omega t}{\pi t}$	$\theta(\omega + \Omega) - \theta(\omega - \Omega) = \begin{cases} 1, & \omega < \Omega \\ 0, & \omega > \Omega \end{cases}$

p. 324 Inversion formula should read

$$f(x, y) = \frac{1}{(2\pi)^2} \iint_{\mathbb{R}^2} F(u, v) e^{i(ux+vy)} du dv.$$

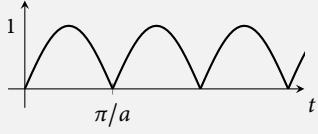
p. 325 Item F₃₁₁, Fourier transform should read $\frac{8\pi \sin au \sin bv}{uv} \delta(w)$

p. 327 Item DF14, Fourier transform should read $\frac{1}{N} \frac{\sin \frac{\pi}{N}}{\cos \frac{2\mu\pi}{N} - \cos \frac{\pi}{N}}$

p. 328 Inversion formula should read

$$x(n) = \frac{1}{2\pi i} \int_{|z|=r} X(z) z^{n-1} dz = \frac{1}{n!} \left(\frac{d}{dz^{-1}} \right)^n X(z) \Big|_{z^{-1}=0}$$

p. 331–336 Table of Laplace transforms

	$f(t)$	$F(s)$
L4.	$f(t-T)\theta(t-T) = \begin{cases} f(t-T), & t > T \\ 0, & t < T \end{cases} \quad (T \geq 0)$	$e^{-Ts} F(s)$
L9.	$f^{(n)}(t)$	$s^n F(s) - \sum_{k=1}^n s^{n-k} f^{(k-1)}(0-)$
L28.	$\frac{-e^{-at} + e^{-bt}}{a - b}$	$\frac{1}{(s+a)(s+b)}$
L29.	$\frac{ae^{-at} - be^{-bt}}{a - b}$	$\frac{s}{(s+a)(s+b)}$
L33.	$\frac{e^{-at} - e^{-bt} + (a-b)te^{-bt}}{(a-b)^2}$	$\frac{1}{(s+a)(s+b)^2}$
L46.	$\frac{1}{b} e^{-at} \sin bt$	$\frac{1}{(s+a)^2 + b^2}$
L47.	$e^{-at} \cos bt$	$\frac{s+a}{(s+a)^2 + b^2}$
L61.	$\frac{a}{2\sqrt{\pi t^3}} e^{-a^2/4t} \quad a > 0$	$e^{-a\sqrt{s}}$
L65.	$\operatorname{erf} \sqrt{at}$	$\frac{\sqrt{a}}{s\sqrt{(s+a)}} \quad (a > 0)$
L69.	$\frac{\cos a\sqrt{t}}{\sqrt{t}}$	$\sqrt{\pi} e^{-a^2/4s} / \sqrt{s}$
L77.	$t J_n(at)$	$n = -1, 0, 1, \dots \quad \frac{(\sqrt{s^2 + a^2} - s)^n (s + n\sqrt{s^2 + a^2})}{a^n (s^2 + a^2)^{3/2}}$
L79.	$J_0(at) - at J_1(at)$	$\frac{s^2}{(s^2 + a^2)^{3/2}}$
L87.	$I_0(at) + at I_1(at)$	$\frac{s^2}{(s^2 - a^2)^{3/2}}$
L107.	 $f(t) = \sin at $	$\frac{a}{s^2 + a^2} \coth \frac{\pi s}{2a}$

p. 340 Item HA9. Transform should read $\frac{2^{1-a}\Gamma\left(1-\frac{a}{2}\right)}{y^{2-a}\Gamma\left(\frac{a}{2}\right)}$

CHAPTER 14 – COMPLEX ANALYSIS

p. 350 Table 14.1. Imaginary part of $\log z$ should read $\theta + 2n\pi$.

CHAPTER 16 – NUMERICAL ANALYSIS

p. 404 Table at the end of the page, item 3 should read $I_h = \frac{h}{6}(f(x_1) + 4f(x_2) + f(x_3))$ (instead of leading factor $\frac{h}{3}$).

CHAPTER 17 – PROBABILITY THEORY

p. 458 Table at the bottom of the page, last item should read

$$\text{Hypergeometric } H(N, n, p) = \frac{\binom{Np}{x} \binom{N-Np}{n-x}}{\binom{N}{n}} \quad np \quad np(1-p) \frac{N-n}{N-1}$$

p. 450 Table at the top of the page, item 3 should read

$$\begin{array}{lll} \text{Weibull} & \lambda^\beta \beta x^{\beta-1} e^{-(\lambda x)^\beta}, \quad x \geq 0 & \frac{1}{\lambda^2} (\Gamma(1 + \frac{2}{\beta}) \\ W(\lambda, \beta) & F(x) = 1 - e^{-(\lambda x)^\beta} & - \Gamma^2(1 + \frac{1}{\beta})) \end{array}$$

CHAPTER 19 – MISCELLANEOUS

p. 508 Table of SI-prefixes, first and second two last lines should read

Power of 10 :	Prefix	Notation
$1\ 000\ 000\ 000\ 000\ 000\ 000\ 000\ 000 = 10^{24}$	yotta	Y
\vdots		
$0.000\ 000\ 000\ 000\ 000\ 000\ 001 = 10^{-21}$	zepto	z
$0.000\ 000\ 000\ 000\ 000\ 000\ 000\ 001 = 10^{-24}$	yokto	y