Corrections to the “Mathematical Formulae” handbook

Current version: 2.4 (March 2016)

Version 1.1 → 1.1r
p15) 10. Integration: the special case should read
\[ \frac{d}{dx} \int_a^x f(y) \, dy = f(x). \]

Version 1.1r → 1.2
p13) 10. Integration: the first integral given is valid for \( n \neq -1 \) (not \( n \neq 1 \)), and the RHS of the integral
\[ \int \frac{x^n}{(x^2 + a^2)^{n+1}} \, dx \]
should read
\[ \cdots = \frac{-1}{2(n-1)} \frac{1}{(x^2 + a^2)^{n-1}} + c. \]

Version 1.2 → 1.3
p2) 1. Series: the second term for \( \tan x \) should be \( x^3/3 \).
p17) 11. Differential Equations: the solution of Laplace’s equation in polar coordinates should read
\[ \cdots \left[ Ap' + Br^{-(l+1)} \right] \cdots \]
and the differential equations for spherical harmonics should read
\[ \left[ \cdots + \frac{1}{\sin^2 \theta} \frac{\partial^2}{\partial \phi^2} \right] \cdots \]

Version 1.3 → 1.4
p1) Physical Constants: the units for \( g \) should be m s\(^{-2}\).
p5) 3. Matrix Algebra: the inverse of a matrix should read ‘cofactor of transpose of \( A_{ij} \)’ not ‘cofactor of \( A_{ij} \)’.
p15) 10. Integration: for the final reduction formulae, \( I_1 \) should be \( 1/2\alpha \).
p17) 11. Differential Equations: for associated Legendre polynomials, \( P_0^0(1) = 1 \).

Version 1.4 → 1.5
p18) 11. Functions of several variables: ‘Stationary points’ revised to read:
A function \( \phi = f(x, y) \) has a stationary point when \( \frac{\partial \phi}{\partial x} = \frac{\partial \phi}{\partial y} = 0 \). Unless \( \frac{\partial^2 \phi}{\partial x^2} = \frac{\partial^2 \phi}{\partial y^2} = \frac{\partial^2 \phi}{\partial x \partial y} = 0 \), the following conditions determine whether it is a minimum, a maximum or a saddle point.

Minimum: \( \frac{\partial^2 \phi}{\partial x^2} > 0 \), or \( \frac{\partial^2 \phi}{\partial y^2} > 0 \),
Maximunm: \( \frac{\partial^2 \phi}{\partial x^2} < 0 \), or \( \frac{\partial^2 \phi}{\partial y^2} < 0 \),
and \( \frac{\partial^2 \phi}{\partial x \partial y} > \left( \frac{\partial^2 \phi}{\partial x^2} \right)^2 \),

Saddle point: \( \frac{\partial^2 \phi}{\partial x^2} \frac{\partial^2 \phi}{\partial y^2} < \left( \frac{\partial^2 \phi}{\partial x \partial y} \right)^2 \).

If \( \frac{\partial^2 \phi}{\partial x^2} = \frac{\partial^2 \phi}{\partial y^2} = \frac{\partial^2 \phi}{\partial x \partial y} = 0 \) the character of the turning point is determined by the next higher derivative.

Version 1.5 → 2.0
p1) Physical Constants, updated to the CODATA 2006 least-squares adjustment values.
p7) 3. Matrix Algebra: an additional 2 pages of tensor algebra (specific to the Part II course on Relativity) were added. But see below.
p25) 15. Laplace Transforms (now p23), added a missing ‘\(^\prime\)’ to the Laplace transform of \( \sin(\omega t) \).
Version 2.0 → 2.1
p7) 3. **Matrix Algebra**: the additional 2 pages of tensor algebra (specific to the previous Part II course on Relativity) were removed.

p21/22) 14. **Fourier Series and Transforms**: added correct normalisation factors (\(2\pi/\tau\) for the Fourier transform of the sampling function, and \(1/2\pi\) to the right hand side of the ‘Conversely’ version of the Convolution theorem).

Version 2.1 → 2.2
p1) **Introduction**: corrected spelling of ‘Formulae’ in the first sentence.

p6) 3. **Matrix Algebra**: ‘Bra-ket’ entry for Hermiticity completed to read

\[
\langle \psi | O | \phi \rangle = \langle \phi | O^\dagger | \psi \rangle^*,
\]

and the Lowest eigenvalue entry completed to read

\[
\lambda_0 \leq \frac{\langle \psi | O | \psi \rangle}{\langle \psi | \psi \rangle}.
\]

Version 2.2 → 2.3
p1) **Physical Constants**, updated to the CODATA 2010 least-squares adjustment values.

Version 2.3 → 2.4
p1) **Physical Constants**, updated to the CODATA 2014 least-squares adjustment values.

Dave Green, March 2016