Errata Sheet

Mathematical Methods for Partial Differential Equations

Many typos from earlier additions have been corrected. Here is list of some of the earlier typos.

Page 36. Example 12, replace $\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = z$ by $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y} = z$

Page 37 Example 13, replace $\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = z$ by $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y} = z$

Page 547 #12, replace $\omega_n = \frac{n\pi}{\ln b}$ by $\omega_n = \frac{(2n+1)\pi}{2\ln b}$

Page 171 Line 6 from bottom. Replace $-c\delta A$ by $-c\varrho A$

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$$\begin{aligned} A(\omega) =& \frac{1}{\pi}\int_{-\infty}^{\infty} f(\xi)\cos\omega\xi\, d\xi \\ B(\omega) =& \frac{1}{\pi}\int_{-\infty}^{\infty} f(\xi)\sin\omega\xi d\xi. \end{aligned} \tag{4.130}$$

Page 224 9 lines from bottom of page. Remove the last 0 after the period.

Page 204 #3(b) Should read $u = x^2 - y^2$

Page 206 #10 replace $u(r, b) = 0$ with $u(r, h) = 0$.

Page 208 #21 Add to bottom of problem the following.

Hint: See example 4-10 and consider a limiting case. See also Appendix D.

Page 297 #38 is repeat of problem #17. Replace problem #38 with the following.
Consider the vibrating string problem

$$\begin{array}{ll} \text{PDE:} & \dfrac{\partial^2 u}{\partial t^2} = c^2\dfrac{\partial^2 u}{\partial x^2}, \quad u = u(x,t), \quad 0 < x < L, \quad t > 0 \\ \text{BC:} & u(0,t) = 0, \qquad u(L,t) = 0 \\ \text{IC:} & u(x,0) = f(x), \qquad \dfrac{\partial u(x,0)}{\partial t} = g(x), \quad 0 < x < L \end{array}$$

which is solved by the method of separation of variables.
(a) Assume that $f(x)$ and $g(x)$ have Fourier sine series expansions of the form

$$f(x) = \sum_{n=1}^{\infty} f_n \sin\frac{n\pi x}{L} \qquad g(x) = \sum_{n=1}^{\infty} g_n \sin\frac{n\pi x}{L}.$$

Express the solution to the vibrating string problem in terms of the coefficients f_n and g_n.
(b) Use the trigonometric identities

$$\begin{aligned} \sin A\sin B =& \frac{1}{2}\left[\cos(A-B) - \cos(A+B)\right] = \frac{1}{2}\int_{A-B}^{A+B}\sin\xi\, d\xi \\ \sin A\cos B =& \frac{1}{2}\left[\sin(A+B) + \sin(A-B)\right] \end{aligned}$$

and show the solution for the vibrating string problem can be written in the form

$$u = u(x,t) = \frac{1}{2}\left[\widetilde{F}(x+ct) + \widetilde{F}(x-ct)\right] + \frac{1}{2c}\int_{x-ct}^{x+ct}\widetilde{G}(\xi)\, d\xi$$

where $\widetilde{F}(x)$, $\widetilde{G}(x)$ are the periodic extensions of $f(x)$, $g(x)$