Errata for Gravity: An Introduction to Einstein's General Relativity

Updated 12/19/2002

xx, Credit for Fig 13.3: Herrnstein not Hernstein.

100, Problem 5.5: The reference should be to Figure 5.6.

133, Problem 6.13: Add a clarifying clause to the fourth sentance so it reads: " Calculate the total elapsed time measured on each clock assuming that the maximum height is much smaller than the radius of the Earth." Delete the last sentence. The question could be confusing.

137, Equation (c): The discussion in this Box is is ok as is, but it would more upwardly compatible (e.g. with Hawking and Ellis) if t' and r' were defined as:

$$\begin{aligned} u' &\equiv \tan^{-1} u \equiv (t'-r')/2 \\ v' &\equiv \tan^{-1} v \equiv (t'+r')/2 \end{aligned}$$

184, Problem 5: The reference to the wormhole metric should be to (7.39) not (8.14).

202, Figure 9.5: The label ℓ should be ℓ/M.

226, Equation 10.13 The formula is in Gaussian units and the sign of the second term is wrong. Replace "... can be modeled by" and the equation by "can be modeled by (SI units)" and this equation

$$n(r) = 1 - \frac{e^2 N(r)}{2\varepsilon_0 m\omega^2}$$

245, Equation (a): The formula for the Thomson cross section is given in Gaussian units. Add to the preceding sentance "(SI units)" and replace eq. (a) by

$$\sigma_T = \frac{8\pi}{3}\left(\frac{e^2}{4\pi\varepsilon_0 m_e c^2}\right)^2 = 0.665\times 10^{-24}\ \mathrm{cm}^2.$$

295, Problem 3: The figure in the text shows two jets and the problem should be amended to reflect that as follows:

"In the image of the radio source Cygnus A in Figure 13.5 one jet is much brighter than the other. Rotating black hole models of the source suggest that the two jets emerge in opposite directions along the rotation axis. What famous effect of special relativity could contribute to an explanation of the difference in brightness. Assuming the intensities differ by a factor of 100, and that the axix makes an angle of 45° with respect to the line of sight, what can you say about the velocity of the sources of the visible radiation in the jets?"

295, Problem 4: replace the sentence beginning "Calculate the predicted...." with "Make a rough *estimate* of the predicted linear orbital velocities as a function of angular separation from the center by assuming that the stars are in circular orbits whose plane is perpendicular to the line of sight."

308, Problem 2: replace "... for a circular orbit." with "... for a circular orbit lying in that plane". (clearer).

309, Problem 8: replace "if the spin starts..." with "if the spatial part of the spin starts ..." (clearer).

315, Equation 15.12: might be clearer if ρ_+ is replaced by $\rho_+(\theta)$ in both places.

328, Problem 1: Italics for "Estimate" to be consitent with usage in other problems.

356, l 2: "apparent magnitude" should be italicized just like absolute magnitude.

395, Figure 18.10: Replace $\Omega_m = 1.5$ with $\Omega_m = 2$.

395, Problem 1: replace "How would $a(t)$ it look..." with "How would $a(t)$ look ..."; replace "at all times assuming the ... isotropic." with "assuming the ... isotropic at all times."

443, Problem 14: In the displayed equation $\nabla_{\mathbf{t}}$ should be $\nabla_{\mathbf{t}}$.

444, Problem 25: Add code [A].

467, Problem 4: replace "of geodesic deviation." with "of geodesic deviation (21.19)." (clearer).

473, eq. 22.10: The first N in this equation should be a $\mathcal{N}$. Only the first! There are four more that are ok so the equation should start $\Delta\mathcal{N} = \cdots$. Then in the immediately preceding line the same thing. "... particles $\Delta\mathcal{N}$ in the three-volume ..."

489, Problem 12: replace "... *A*, *B*, and *C* are functions..." with "... *A*, *B*, *C*, and *D* are functions...".

512, Problem 11: replace the sentences beginning "Calculate ..." with "Calculate the gravitational wave metric perturbations at a large distance L along the positive $z-$axis." (The problem involved calculating energy flux for non-harmonically varying sources for which the energy flux expression was only covered in a Web supplement.)

538, Problem 10: add to the end as follows: "... of area $4\pi R^2$ and negligible mass. (The shell is not made of realistic matter.)"