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Erratum

Erratum to: Entropy of self-gravitating anisotropic matter

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1. The Eq. (45) should read

$$s = s_0 \rho^{1-\frac{1}{2w_2}} r^{-\frac{1+w_2}{w_2}} \sqrt{\frac{1-2m/r}{1-2\bar{m}/r}}, \tag{1}$$

where $\bar{m} = m - M$.

2. Contrary to the Lagrangian (37) which is deduced from the first principle, there is no guarantee that the trial Lagrangian (39) represents the true entropy for $w_1 = -1$ although it matches well for $w_1 \neq -1$ cases.
The Lagrangian corresponding to a, b in Eq. (44) is

$$\mathcal{L} \propto (\bar{m}')^{1-\frac{1}{2w_2}} r^{-1} / \sqrt{1-2\bar{m}/r}. \tag{2}$$

However, if the solutions are analytic around $w_1 = -1$, the $w_1 \to -1$ limit of the Lagrangian (37) gives

$$\lim_{w_1 \to -1} \mathcal{L} \propto (m')^{1-\frac{1}{2w_2}} r^{-1}, \tag{3}$$

which is different from the above Lagrangian. Thus, one should be cautious in using the entropy density for $w_1 = -1$.
Therefore, the exact form of the entropy density for $w_1 = -1$ should be derived by taking $w_1 \to -1$ limit of the entropy function Eq. (47). The entropy density so obtained has the form

$$s = s_0 \rho^{1-\frac{1}{2w_2}} r^{-\frac{1+w_2}{w_2}} \sqrt{1-2m/r}. \tag{4}$$

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