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Lista Aula 18

(A) Calcule o raio de Schwarzschild de um buraco negro de massa $12 M_{\odot}$

$$R_{\text{SCH}} = \frac{2GM}{c^2}$$

$$G = 6,67 \times 10^{-8} \text{ cm}^3 \text{ g}^{-1} \text{ s}^{-2}$$

$$M_{\odot} = 1,99 \times 10^{33} \text{ g}$$

$$c = 3 \times 10^8 \text{ m s}^{-1} \Rightarrow c = 3 \times 10^{10} \text{ cm s}^{-1}$$

$$R_{\text{SCH}} = \frac{2 \times 6,67 \times 10^{-8} \times 12 \times 1,99 \times 10^{33}}{(3 \times 10^{10})^2} \Rightarrow R_{\text{SCH}} = 3,54 \times 10^6 \text{ cm}$$

(B) Qual a densidade de massa média dentro do volume limitado pelo horizonte de eventos deste buraco negro?

$$V = \frac{4}{3} \pi r^3 \Rightarrow V = \frac{4}{3} (3,14) (3,54 \times 10^6)^3$$

$$\Rightarrow V = 185,72 \times 10^{18} \text{ cm}^3$$

$$M = 12 \times 1,99 \times 10^{33}$$

$$M = 2,388 \times 10^{34} \text{ g}$$

$$d = \frac{M}{V} \Rightarrow d = \frac{2,388 \times 10^{34}}{185,72 \times 10^{18}}$$

$$d = 1,28 \times 10^{14} \text{ g cm}^{-3}$$