$$v_{1M} = \sqrt{\frac{G \cdot M_M}{R_M}}$$

$$v_{1M} = \sqrt{\frac{G \cdot \rho_M \cdot V_m}{R_M}}$$

$$v_{1M} = \sqrt{\frac{4}{3}\pi \rho_M G R_M^2}$$

$$v_{1M} = 2R_M \sqrt{\frac{1}{3}\pi \rho_M G}$$

$$0{,}45\, v_{1Z} = 1{,}066 \cdot R_Z \sqrt{\frac{1}{3}\pi \rho_M G}$$

$$0{,}2025 \cdot v_{1Z}^2 = 1{,}136356 \cdot R_Z^2 \cdot \frac{1}{3}\pi \rho_M G$$

$$0{,}1782 \cdot v_{1Z}^2 \approx \frac{1}{3} R_Z^2 \pi \rho_M G$$

$$0{,}5346 \cdot v_{1Z}^2 \approx R_Z^2 \pi \rho_M G$$

$$\rho_M = \frac{0{,}5346 \cdot v_{1Z}^2}{R_Z^2 \pi G}$$

$$\rho_M = \frac{0{,}5346 \cdot \left(7{,}9 \cdot 10^3 \frac{m}{s}\right)^2}{(6{,}4 \cdot 10^6 m)^2 \cdot 3{,}14 \cdot 6{,}67 \cdot 10^{-11} \frac{m^3}{kg \cdot s^2}}$$

$$\approx \frac{33{,}364386 \cdot 10^6 \frac{m^2}{s^2}}{857{,}858048 \cdot 10^{12-11} \frac{m^5}{kg \cdot s^2}} = \frac{33{,}364386 \cdot 10^6 \frac{m^2}{s^2}}{857{,}858048 \cdot 10 \frac{m^5}{kg \cdot s^2}}$$

$$\approx 0{,}0039 \cdot 10^6 \frac{kg}{m^3} = 3{,}9 \cdot 10^{-3} \cdot 10^6 \frac{kg}{m^3} = \boxed{3{,}9 \cdot 10^3 \frac{kg}{m^3}}$$

Wyznaczamy szukaną wielkość

podnosimy do kwadratu

podstawiamy dane do wzoru