(1)

$$\frac{e^2}{4\pi\varepsilon_0 r} < \frac{p_0^2}{2m_e} \qquad p_0 = \left(\frac{3h^3 n_e}{8\pi}\right)^{1/3}$$

$n_e$ (spodnja meja)

$$n_e \propto \frac{1}{r^3} \qquad r \propto \left(\frac{1}{n_e}\right)^{1/3}$$

$$\frac{e^2 n_e^{1/3}}{4\pi\varepsilon_0} < \left(\frac{3h^3}{8\pi}\right)^{2/3} \frac{n_e^{\cancel{2/3}\,1/3}}{2m_e}$$

$$n_e^{1/3} > \frac{e^2 \cancel{2} m_e}{2\cancel{4}\pi\varepsilon_0} \cdot \left(\frac{8\pi}{3h^3}\right)^{2/3} \qquad (\ )^3$$

$$n_e > \left(\frac{e^2 m_e}{\varepsilon_0}\right)^3 \cdot \left(\frac{1}{2\pi}\right)^3 (8\pi)^2 \cdot \left(\frac{1}{3h^3}\right)^2$$

$$n_e > \frac{8}{9\pi}\left(\frac{e^2 m_e}{\varepsilon_0 h^2}\right)^3$$

$$n_e > \underline{6\cdot 10^{28}\ m^{-3}}$$

$\varepsilon_0 \approx 8{,}85\cdot 10^{-12}\ \frac{F}{m}$ / $\frac{s^4A^2}{m^2kg}$

$m_e = 9{,}1\cdot 10^{-31}\ kg$

$h = 6{,}62\cdot 10^{-34}\ \frac{m^2kg}{s}$

$e = 1{,}6\cdot 10^{-19}\ C$

(2)

$$\frac{dp}{dr} = -\frac{G\rho m}{r^2} \qquad \tau = -\kappa\rho r$$

$$g = \frac{Gm}{r^2}$$

$$\frac{dp}{dr} = -g\rho \qquad \Big|:\kappa\rho$$

$$\frac{dp}{\underbrace{-dr\cdot\kappa\rho}_{d\tau}} = +\frac{g\cancel{\rho}}{\kappa\cancel{\rho}}$$

$$\boxed{\frac{dp}{d\tau} = +\frac{g}{\kappa}}$$

$$g_R = G\frac{M}{R^2} \quad \text{v fotosferi} \quad (m, \overset{\text{debelina}}{r}_{\text{fotosfere}} \ll M, R_{\text{zvezde}})$$

$$\kappa_R = \text{konst.}$$

$$\int_\infty^R \kappa\, dp = \int_\infty^R g\, d\tau$$

$$\kappa_R \int_\infty^R dp = g_R \underbrace{\int_\infty d\tau}_{=1}$$

$$\kappa_R P_R = g_R$$

$$\kappa_R P_R = G\frac{M}{R^2} \qquad P_R = \frac{GM}{\kappa_R R^2}$$

(v fotosferi)

$$\frac{2\cdot 10^{30}\,\text{kg}\cdot\kappa_R}{8\pi\, 7\cdot 10^{16}\cdot 7} \sim 10^{11-12}$$

$$dm = \rho\, 4\pi r^2 dr$$

$$\frac{P_c}{P_R} = ?$$

(v fotosferi)

$$P_c > \frac{GM^2}{8\pi R^4}$$

$$\frac{P_c}{P_R} > \frac{\cancel{G}M^{\cancel{2}}}{8\pi R^{\cancel{4}2}}\cdot\frac{\kappa_R \cancel{R^2}}{\cancel{GM}}$$

$$\frac{P_c}{P_R} > \frac{M\kappa_R}{8\pi R^2}$$

$$\frac{dp}{dr} = -\frac{G\rho m}{r^2}$$

$$\int dp = -\int \frac{G\rho m}{r^2}dr$$

$$= -\int G\frac{\rho\cdot 4\pi r^2\cdot m\cdot dr}{4\pi r^2 r^2}$$

$$= -\int G\frac{m\, dm}{4\pi r^4}$$

$$r = R$$