SN1a, solutions

3.

©tidal accelerations on the surface of the red giant (radius r1, mass m1) by the white dwarf (r2,m2) in distance d:

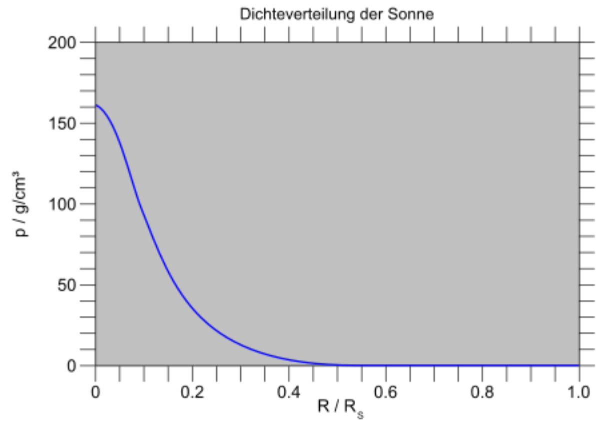
$$da=g\cdot m2\left(\frac{1}{(d-r1)^2}-\frac{1}{(d+r1)^2}\right) \qquad da=m2\left(\frac{1}{(d-r1)^2}-\frac{1}{(d+r1)^2}\right)\cdot g$$

$$da=\frac{4\cdot g\cdot m2}{d^3}\cdot r1 \qquad da=\frac{4\cdot g\cdot m2\cdot r1}{d^3}$$

©when da is greater than the surface−acceleration of the red giant it bursts:

$$\text{solve}\left(da=\frac{g\cdot m1}{r1^2},d\right) \qquad d=\frac{m2^{\frac{1}{3}}\cdot r1\cdot 2^{\frac{2}{3}}}{m1^{\frac{1}{3}}}$$

4.



$$\int_0^r \left(4\cdot\pi\cdot roh\cdot x^2\right)dx \qquad \frac{4\cdot roh\cdot\pi\cdot r^3}{3}$$

©for the sun is a ~ 9 and at sunradius r roh is about 0, therefore you can integrate at ∞.

$$©\int_0^\infty \left(4\cdot\pi\cdot \mathrm{roh0}\cdot e^{\frac{-a}{r}\cdot x}\cdot x^2\right)dx=4\pi\cdot \mathrm{roh0}\cdot\left(\frac{r}{a}\right)^3\int_0^\infty\left(e^{-x}\cdot x^2\right)dx=8\frac{\pi\cdot \mathrm{roh0}}{a^3}\cdot r^3$$

5. Number N of Electrons is equal to the number of Protons, my*N*mp = m is the mass of the star. Therefore, every electron hast the space dr^3 = V/N = V*my*mp/m = my*mp/roh with protonmass mp. The Fermi-Energy is:

dE = $h^2/(8pi^2*m*dr^2) = h^2/(8pi^2*me*dr^2) = h^2/(8pi^2*me)$*(roh/my*mp)^2/3

and if it is much greater than the termal Energy the gas is „entartet“.

From gas-theory we know p = n*kb*T with particle density n = N/V and Boltzmann konstant, and the thermal Energy is E = 1.5*kb*T. Than p = 2/3*n*E and we suppose it is valid for Fermi-Energy, too. Then follows the estimated equation.

$$©p(h) = \int_0^h (roh \cdot g(r-x))dx$$ with $g(x)=\frac{g \cdot m(r)}{r^2}$ gives for the presure at the center

$$p=\frac{3 \cdot g \cdot m^2}{8 \cdot \pi \cdot r^4}$$

Compare with the „Entartung“ pressure you geht the law
r ~ m^-(1/3)
If the Star gets more massiv it shrinks.