$$dm \quad = \quad (4\pi r^2 dr)\ \rho(r)$$

$$M \quad = \quad \int_0^R dm \quad = \quad \int_0^R 4\pi r^2 \rho(r) dr$$

$$M \quad = \quad 4\pi\rho \int_0^R r^2 dr$$

$$M \quad = \quad 4\pi\rho \int_0^R r^2 dr \quad = \quad 4\pi\rho \left|\frac{1}{3}r^3\right|_0^R \quad = \quad \frac{4}{3}\pi\rho R^3$$

$$\frac{dM_r}{dr} \quad = \quad 4\pi r^2\, \rho$$

$$F_{\rm net} \quad = \quad F_{\rm grav} \ + \ F_{\rm top} \ + \ F_{\rm bot}$$

$$F_{\rm net} \quad = \quad -\frac{GM_r\, dm}{r^2} \ - \ A\, P_{r+dr} \ + \ A\, P_r$$

$$F_{\rm net} \quad = \quad -\frac{GM_r\, (\rho A dr)}{r^2} \ - \ A\ (P_{r+dr} - P_r)$$

$$F_{\rm net} \quad = \quad -\frac{GM_r\, (\rho A dr)}{r^2} \ - \ A\ \left(P_r + \frac{dP}{dr}dr - P_r\right)$$

$$F_{\rm net} \quad = \quad -\frac{GM_r\, (\rho A)}{r^2}\, dr \ - \ A\ \left(\frac{dP}{dr}dr\right)$$

$$\frac{F_{\rm net}}{A} \quad = \quad -\frac{GM_r\, \rho}{r^2}\, dr \ - \ \frac{dP}{dr}dr$$

$$\frac{dP}{dr} \quad = \quad -\frac{GM_r\, \rho}{r^2}$$

$$\frac{\Delta P}{R} \quad = \quad \frac{P_{\rm surface} - P_{\rm center}}{R} \quad \sim \quad -\frac{GM\rho}{R^2}$$

$$PV \quad = \quad NkT \qquad \text{or} \qquad P \quad = \quad nkT$$

$$n \quad = \quad \frac{\rho}{m}$$

$$n \quad = \quad \frac{\rho}{\bar{m}}$$

$$P = \frac{\rho}{\bar{m}} kT$$

$$\mu = \frac{\bar{m}}{m_H}$$

$$P = \frac{\rho}{\mu m_H} kT$$

$$P_{\rm rad} = \frac{4\sigma}{3c} T^4 = \frac{1}{3} aT^4$$