$$2K + U = 0$$

$$K = \frac{3}{2} NkT$$

$$U = -\frac{3}{5}\frac{GM^2}{R}$$

$$N = \frac{M}{\mu m_H} = \frac{\frac{4}{3}\pi R^3 \rho}{\mu m_H}$$

$$K = \frac{3}{2} kT \left(\frac{4\pi R^3 \rho}{3\mu m_H}\right) = 2kT \left(\frac{\pi R^3 \rho}{\mu m_H}\right)$$

$$U = -\frac{3}{5}\frac{G\left(\frac{4}{3}\pi R^3 \rho\right)^2}{R}$$

$$U = -\frac{16}{15} G\pi^2 R^5 \rho^2$$

$$2\left[2kT \frac{\pi R^3 \rho}{\mu m_H}\right] = \frac{16}{15} G\pi^2 R^5 \rho^2$$

$$\frac{4kT}{\mu m_H} = \frac{16}{15}\pi G R^2 \rho$$

$$R = \sqrt{\frac{15kT}{4\pi G\rho\,\mu m_H}}$$

$$K = \frac{3}{2} kT \left(\frac{M}{\mu m_H}\right)$$

$$3kT \frac{M}{\mu m_H} = \frac{3}{5}\frac{GM^2}{R}$$

$$M = \frac{kT}{\mu m_H}\frac{5R}{G}$$

$$M = \frac{4}{3}\pi R^3 \rho \implies R = \left(\frac{3M}{4\pi\rho}\right)^{1/3}$$

$$M = \left(\frac{5kT}{G\mu m_H}\right)^{3/2} \left(\frac{3}{4\pi\rho}\right)^{1/2}$$

$$\sigma_\lambda \propto \frac{1}{\lambda}$$

$$\sigma_\lambda \simeq \text{constant}$$

$$\sigma_\lambda \propto \frac{1}{\lambda^4}$$