

Stellar Structure Equations

1. Equation of Hydrostatic Equilibrium

$$\frac{\Delta P(r)}{\Delta r} = -\frac{GM(r)\rho(r)}{r^2}$$

2. Equation of Continuity of Mass

$$\frac{\Delta M(r)}{\Delta r} = 4\pi r^2 \rho(r)$$

3. Equation of Energy Transport

$$\frac{\Delta T(r)}{\Delta r} = -\frac{3\kappa\rho(r)L(r)}{16\pi a c r^2 T(r)^3} \quad \text{Radiative Diffusion}$$

$$\frac{\Delta T(r)}{\Delta r} = \frac{(\Gamma_2 - 1)}{\Gamma_2} \frac{T(r)}{P(r)} \frac{\Delta P(r)}{\Delta r} \quad \text{Convection}$$

4. Equation of Thermal Equilibrium

$$\frac{\Delta L(r)}{\Delta r} = 4\pi r^2 \rho(r) \epsilon(r)$$