In[8]:= `Clear["Global`*"]`
`Msun = 2 × 10^33;`

$$Mdotsol = \left(\frac{Msun}{3.15 \times 10^7}\right)$$

`G = 6.67 × 10^-8;`
`c = 3 × 10^10;`
`σ = 5.67 × 10^-5;`
`kb = 1.38 × 10^-16;`
`mp = 1.67 × 10^-24;`
`(*r3=1;`

$$Rs = 2 \ G \ \frac{M}{c^2};$$

`R=r3 1000 Rs;`
`kb=1.38 10^-16;`
`κes=0.4;`

$$Ledd = 4\pi \ G \ \frac{M}{\kappa es} c$$

$$Mdot = \frac{Ledd}{c^2 \ 0.1}$$

$$(*\Omega = \sqrt{G \ \frac{M}{R^3}} \ *)\ *)$$

$$Tc = 8 \times 10^4 \ \mu 0^{1/5} \ \mu e^{-1/5} \ r3^{-9/10} \ M_7^{-1/5} \ \alpha_{0.3}^{-1/5} \ f_T^{1/5} \left(\frac{\dot{m}}{\epsilon_{0.1}}\right)^{2/5} \hat{\kappa}^{1/5} \ ;$$

$$L_{Edd} = 4 \ \pi \ G \ \frac{M_7}{0.4 \ \mu e \ \hat{\kappa}} \ c \ 10^7 \ Msun;$$

$$\dot{M}_{Edd} = \frac{L_{Edd}}{c^2 \ \epsilon_{0.1} \ 0.1};$$

$$\dot{M} = \dot{m} \ \dot{M}_{Edd};$$

$$R_s = 2 \ G \ \frac{M_7}{c^2} \ 10^7 \ Msun;$$

$$\frac{\dot{M}}{3 \ \pi \ \frac{kb \ Tc}{\mu 0 \ mp} \ 0.3 \ \alpha_{0.3}} \left(G \ \frac{M_7 \ 10^7 \ Msun}{r3^3 \ (10^3 \ R_s)^3}\right)^{1/2} \ \text{// Simplify[\#, Assumptions → \{M_7 > 0, r3 > 0\}] \&}$$

Out[10]= 6.34921×10^{25}

Out[21]= $$\frac{169123. \ \mu 0^{4/5} \left(\frac{\dot{m}}{\epsilon_{0.1}}\right)^{3/5}}{\mu e^{4/5} \ \hat{\kappa}^{6/5} \left(\frac{r3^3 \ f_T}{M_7}\right)^{1/5} \alpha_{0.3}^{4/5}}$$

```
(*Example of a particular profile*)
M = 10^7 Msun;
R = 1000 × 2 G M/c^2 ;
Σ = 35035;
Ṁ = 1.40 × 10^24;
ν = Ṁ/(3 π Σ) ;
Ω = √(G M/R^3) ;

Teff = (((9/8) ν Σ) Ω^2/σ)^0.25
profile = Import[NotebookDirectory[] <> "profile-35035-1.40E24-1000", "Table"];
u0 = profile[[All, 1]] // Min;
umax = profile[[All, 1]] // Max;
t1 = Show[{profile[[All, {1, 4}]]} // ListLinePlot, Plot[Teff, {u, u0, umax}],
   PlotRange → All, AxesLabel → {"u", "T"}, AxesOrigin → {0, 0}]

{profile[[All, {1, 2}]]} // ListLinePlot[#, AxesLabel → {"u", "z"}] &
{profile[[All, {1, 3}]]} // ListLinePlot[#, AxesLabel → {"u", "ρ"}] &
profile[[All, {2, 4}]] // ListLinePlot[#, PlotRange → All, AxesOrigin → {0, 0}] &
```

Out[103]= 20 000 000 000 000 000 000 000 000 000 000 000 000 000 000

Out[109]= 3505.

Out[113]=

Out[114]=

z

2.0×10^{13}

1.5×10^{13}

1.0×10^{13}

5.0×10^{12}

5000   10 000   15 000   u

Out[115]=

ρ

1.4×10^{-9}

1.2×10^{-9}

$1. \times 10^{-9}$

$8. \times 10^{-10}$

$6. \times 10^{-10}$

$4. \times 10^{-10}$

$2. \times 10^{-10}$

5000   10 000   15 000   u

Out[116]=

25 000

20 000

15 000

10 000

5000

5.0×10^{12} 1.0×10^{13} 1.5×10^{13} 2.0×10^{13}