all units in CGS

In[8]:= γr

Out[8]= 1.

r = 1000 AU

In[12]:= $r = 1.496 * 10^{16}$

Out[12]= 1.496×10^{16}

In[60]:= r^2

Out[60]= 2.23802×10^{32}

M = 1 Solar mass

In[14]:= $M = 1.989 * 10^{33}$

Out[14]= 1.989×10^{33}

In[15]:= $G = 6.67 * 10^{-8}$

Out[15]= 6.67×10^{-8}

T = 1000 K

sound speed c (cm / s)

In[79]:= $c = \sqrt{\frac{1.4 * 1.38 * 10^{-16} * 1000}{1.67 * 10^{-24}}}$

Out[79]= 340 130.

In[18]:= $\xi = \left(\frac{r * c^2}{G * M}\right)$

Out[18]= 13.0455

In[56]:= $u = .0035$

Out[56]= 0.0035

In[57]:= $\text{Solve}\left[\Lambda == \frac{\frac{1}{2} u^2 + \frac{1}{\gamma - 1} - \frac{1}{\xi}}{\left(\xi^2 * u\right)^{\gamma r}}, \Lambda\right]$

Out[57]= $\{\{\Lambda \to 4.06841\}\}$

In[23]:= Clear[Λ]

In[58]:= $rcrit = \frac{\left(G * M\right)^3}{8 * u * c^6 * r^2}$

Out[58]= 2.40652×10^{14}

In[80]:= vout = u * c

Out[80]= 1190.46

^ this is the value solver should give ...
(except this is scaled -- need to check computational unit value)

rhoout (g / cm^3)

In[81]:= rhoout = 1.6737 * 10^-24 * 10 000

Out[81]= 1.6737×10^{-20}

In[86]:= mdot = (rhoout) * vout * r^2

Out[86]= 4.45917×10^{15}

In[65]:= (g / s)

Out[65]= $\frac{g}{s}$

In[77]:= $\text{mdot} * \frac{3.154 * 10^7}{1.989 * 10^{33}}$

Out[77]= 7.07104×10^{-11}

(solar masses / year)

In[74]:= 7.07 * 10^-11 * 10^10

Out[74]= 0.707

In[87]:= $\text{Kadiabatic} = \frac{c^{2/(.4)}}{\text{rhoout}}$

Out[87]= 2.71988×10^{47}

In[88]:= $B = \frac{\text{vout}^2}{2} + \frac{c^2}{.4} - \frac{G * M}{r}$

Out[88]= 2.80354×10^{11}

In[90]:= $\Lambda a = 4 * B * \frac{(G * M)^2}{4 * \text{Kadiabatic} * \text{mdot}}$

Out[90]= 4.06841

In[91]:= rscale = rhoout

Out[91]= 1.6737×10^{-20}

In[93]:= lscale = r

Out[93]= 1.496×10^{16}

In[94]:= `tempscale = 1000`

Out[94]= 1000

In[454]:= $rc = \frac{(G * M)}{2} * \left(\frac{(G * M)^2}{4 * Kadiabatic * mdot} \right)$

Out[454]= 2.40652×10^{14}

In[453]:= `rcCU = rc / lscale`

Out[453]= 0.0160863

In[448]:= $rbondi = \frac{G * M}{c^2}$

Out[448]= 1.14675×10^{15}

^ how to interpret this if it changes with radius ??

In[449]:= `rbondiCU = rbondi / lscale`

Out[449]= 0.0766546

In[450]:= `dxmin = .03125`

Out[450]= 0.03125

In[113]:= $M / rhoout / r^3$

Out[113]= 35 494.6

^ this is computational mass of sink particle