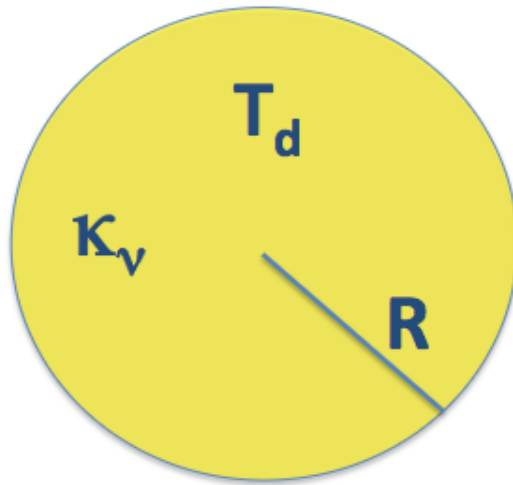


AST 300B – Spring 2017

In-class/take-home Problems Due: Wednesday Feb. 15

20. Consider a spherical, optically thin dust cloud with constant dust temperature T_d , constant dust opacity κ_v , and a radius R . Using the results from a previous homework, derive an equation relating the observed flux density of this cloud at a distance $d \gg R$ to the mass of the cloud M . Write your answer in terms of the mass opacity κ_v of the cloud.



21. Consider a millimeter mapping survey of the Rho Ophiuchus molecular cloud at $\lambda = 1.3$ mm. If the cloud is located at a distance of 125 pc (the nearest molecular cloud to the Earth) and the mapping has a 3-sigma flux density sensitivity of 0.1 Jy, what gas mass is the survey sensitive to (quote your answer in solar masses). Could this survey detect dense cores capable of forming stars down to the hydrogen burning limit ($M \sim 0.08 M_{\text{sun}}$)? $\kappa_v \sim 0.9 \text{ cm}^2/\text{g}$ of dust at 1.3mm (OH5).