Problem 2 T+L 3.1

What is $\frac{\epsilon_\lambda}{\epsilon_{total}}$ where ϵ_λ is due to eddies of size $\eta \ll \lambda \ll \ell$

use result from T+L prob. 1.3

$$v(\lambda) \tilde{=} (\lambda \epsilon)^{1/3} \sim (\lambda u^3/\ell)^{1/3} = u\left(\frac{\lambda}{\ell}\right)^{1/3}$$

but $\lambda/\ell \sim R_\ell^{-1/2} \sim R_\lambda^{-1}$ (3.2.17)

so $v(\lambda) \sim u R_\ell^{-1/6} \sim u R_\lambda^{-1/3}$

$\epsilon_{total} \sim \frac{\nu u^2}{\lambda^2}$, definition of Taylor microscale

ϵ_λ due to strain rate $\frac{v_\lambda}{\lambda} \rightarrow \nu \frac{v_\lambda^2}{\lambda^2} \sim \nu \frac{u^2}{\lambda^2} R_\ell^{-1/3}$

$$\frac{\epsilon_\lambda}{\epsilon_{total}} \sim R_\ell^{-1/3} \sim R_\lambda^{-2/3} \ll 1 \text{ for large } R_\ell, R_\lambda$$