

Turbulent Flows
Stephen B. Pope
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Solution to Exercise 7.8

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From Fig. 7.18, we can directly infer that

$$\varepsilon_0^+ \approx 0.22.$$

The Kolmogorov length scale is

$$\begin{aligned} \eta &\stackrel{(5.149)}{=} \left(\frac{\nu^3}{\varepsilon} \right)^{1/4} \\ &\stackrel{(7.26)}{=} \left(\frac{\delta_v^3 u_\tau^3}{\varepsilon} \right)^{1/4} \\ &= \left(\frac{\delta_v \varepsilon}{\delta_v^4 u_\tau^3} \right)^{-1/4} \\ &= \delta_v (\varepsilon^+)^{-1/4}. \end{aligned}$$

Evaluating η at the wall, using the value previously extracted from the figure, results in

$$\frac{\eta_{y=0}}{\delta_v} = (\varepsilon_0^+)^{-1/4} \approx (0.22)^{-1/4} = 1.46.$$

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