

Homework Assignment 4 (due 12 noon, Fri Oct 7th) (*revised*)

This assignment is composed of the following questions from Chapters 4, 5 and 6 of *An Introduction to Modern Stellar Astrophysics*, augmented with a supplementary question:

- Show that the relativistic Doppler shift for purely radial motion with $v_r \ll c$ gives $z \equiv \frac{\Delta\lambda}{\lambda_{\text{rest}}} \approx \frac{v_r}{c}$. Suppose a star is moving with $\frac{v_r}{c} = 10^{-4}$; how close does its angle of motion θ have to be to 90° for this first-order approximation to break down? **HINT:** Use the first-order Taylor series expressions $\sqrt{1 \pm x} \approx 1 \pm \frac{x}{2}$ and $(1 \pm x)^{-1} \approx 1 \mp x$ for $x \ll 1$.
- Q4.8
- Q5.1
- Q5.2
- Q5.11
- Q6.2
- Q6.8
- Q6.15