

A74 EXERCISES: Radiative flux (1.1-1.3)

1. Derive the inverse square law (R&L Eq 1.13) from the net flux (R&L Eq 1.3b).
2. Consider being bathed in a weakly anisotropic (that is, non-uniform) field where the intensity is given by:

$$I(\theta, \phi) = I_0(1 + \epsilon \cos \theta) \quad (1)$$

where θ is the angle with respect to some fixed vector \mathbf{n} . ϵ defines the degree of anisotropy by providing a directionality to the field. Consider a plane normal to \mathbf{n} . The integrals in this problem will be simpler if you make the substitution $\mu = \cos \theta$.

- a. What is the flux crossing the plane per unit time? What happens as the anisotropy vanishes and why?
- b. What is the average pressure (note this is equivalent to momentum flux per unit area) exerted by the radiation field?
- c. Can you think of one or more physical situations where such a weakly anisotropic field would be relevant?