

**Problem W1:**

A quantity  $x$  has a distribution function defined by

$$f(x) = \begin{cases} Ax & \text{for } 0 < x < x_0 \\ 0 & \text{everywhere else} \end{cases}$$

- (a) Find the normalization constant  $A$  (in terms of  $x_0$ ).
- (b) Find the mean value of  $x$ .
- (c) Find  $x_{\text{rms}}$ .

**Problem W2:**

Suppose we have a collection of hypothetical atoms with states at energies of 0.0, 0.1 and 0.2 eV. Assume that each state has a degeneracy of 1.

- (a) Find the fraction of atoms in each state at  $T = 300$  K.
- (b) Find the average energy.

**Problem W3:**

- (a) Estimate the total power (in watts) radiated by the sun assuming it is a blackbody of temperature 5800 K. The radius of the sun is  $7 \times 10^8$  m.
- (b) At what rate is the mass of the sun decreasing?
- (c) In the nuclear reactions that take place in the sun, roughly 1% of the mass is converted into energy. Given that the mass of the sun is about  $2 \times 10^{30}$  kg, roughly how long can we expect the sun to continue burning?