

## PHY206 Problem class 2 - relativity problem.

Question PHY206, relativity problem 2.

- (a) [ 2 points ] A  $\pi^0$ -meson has a mass of  $2.4 \times 10^{-28}$  kg. What is the energy of a  $\pi^0$ -meson at rest, in MeV? (1 eV is the energy imparted to an electron when it is accelerated through a voltage of 1 V. You can figure out how many joules this is by working out how much work is done on the electron in moving through this potential difference).
- (b) [ 1 point ] A  $\pi^0$ -meson decays into two photons. What are the wavelengths of each of the two photons as measured by an observer at rest with respect to the original  $\pi^0$ -meson ?
- (c) [ 2 points ] If a  $\pi^0$ -meson is moving towards an observer at a speed  $3c/4$ . It decays into two photons. One of these photons is emitted in a direction travelling directly towards the observer. What is its wavelength as measured by this observer? The other photon is emitted in the opposite direction. What is the wavelength of this other photon as measured by a second observer at rest with respect to the first one, positioned on the opposite side of the  $\pi^0$ -meson when it decays?