Physics 7314 Professor Scalise
Homework Assignment #1

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1. A photon strikes an electron at rest and undergoes pair production, producing a positron and another electron. The two electrons and the positron move off with identical speeds in the direction of the initial photon. What is the photon energy? What is the kinetic energy of the positron?

2. A particle of mass M at rest decays into a photon and a particle of mass $m < M$. What is the photon energy?

3. (a) What is the Lorentz matrix Λ for a boost along the x direction by speed $\beta = \frac{v}{c}$?
   (b) What is the Lorentz matrix Λ for a boost along the y direction by speed $\beta = \frac{v}{c}$?
   (c) Show that a boost along x by β, followed by a boost along y by β, followed by a boost along x by $-\beta$, followed by a boost along y by $-\beta$ for small β results in a rotation in the xy plane. Keep terms of order β^2. What is this Thomas rotation angle?