Homework 10:

Remember: In addition to this problem, you also have a "Mastering Physics" assignment Due April 18 Due at the **beginning** of lecture, Friday, April 18 Write up of the solution to this problem in a coherent fashion.

Suppose we have two particles each of mass *M*. One of the particles is at rest (in your rest frame) and the other is traveling with a speed of v_0. Suppose the two particles crash and stick together to form a new particle.

a. Show that the total energy of the systems (which is the sum of the energies of the two particles) is $E = Mc^2\left(1+\frac{1}{\sqrt{1-\frac{v_0^2}{c^2}}}\right)$.

b. Show that the magnitude of the total momentum is $p = M\frac{v_0}{\sqrt{1-\frac{v_0^2}{c^2}}}$.

c. Show that the mass of the new particle is $M_{new} = M\sqrt{2\left(1+\frac{1}{\sqrt{1-\frac{v_0^2}{c^2}}}\right)}$.

d. Show that the speed of the new particle is $\frac{v_0}{\sqrt{1-\frac{v_0^2}{c^2}}+1}$