Trajectories – Physics
Winter – Quiz 6

Name:_____

$$v = \frac{\Delta x}{\Delta t} \qquad \frac{\text{speed 1} \pm \text{speed 2}}{1 \pm \frac{(\text{speed 1})(\text{speed 2})}{c^2}} \qquad (\Delta S)^2 = (c\Delta t)^2 - \left[(\Delta x)^2 + (\Delta y)^2 + (\Delta z)^2\right] = (c\Delta t)^2 - (\Delta x)^2$$

$$\Delta t_{proper} = \Delta t_{2-clock}\sqrt{1-(v/c)^2} \qquad L_{other} = L_{rest}\sqrt{1-(v/c)^2} \qquad (\Delta S)^2 = (\Delta S')^2$$

$$\vec{p} = \frac{m\vec{u}}{\sqrt{1-u^2/c^2}} \qquad E^2 = (pc)^2 + (mc^2)^2 \qquad m = m'$$

$$E = \frac{mc^2}{\sqrt{1-u^2/c^2}} \qquad \vec{u} = \frac{\vec{p}c^2}{E} \qquad K = E - mc^2$$

1) In some reference frame, a particle is measured to have mass 15 MeV/c^2 and total energy 25 MeV. Determine (in any order you wish) this particle's:

a) kinetic energy

b) momentum

c) speed

2) In some other reference frame, the same particle as in question 1) is measured to have total energy 39 MeV and speed $\frac{12}{13}c$.

a) Which of the following quantities ***also change*** in this other reference frame? (circle all that apply)

kinetic energy	**mass**	**momentum**	**none of these change**

b) Briefly explain your reasoning for your choice.

3) ****note: this may be a challenging question. Do your best.****

Determine the relative speed of the two reference frames involved in questions 1) and 2).