Answer all questions in the blue notebook provided. In order to receive the most credit show all your work and indicate your reasoning clearly.

1. A photon rocket "burns" a fraction of its initial mass to reach a cruising speed. With this speed it flies between two planets that are three light-hours apart. The time elapsed on the rocket's clock during the flight is four hours.

   (a) What is the cruising speed of the rocket (in the planets' reference frame)?

   (b) What fraction of the initial mass of the rocket has been burned to reach the cruising speed?

2. A stationary particle of mass M decays into another particle of mass m and a photon.

   (a) What is the energy of the photon?

   (b) What is the speed of the particle?