Problem Set 5
Physics, summer 2020/21

1) **(4p.)** Suppose a cosmic ray colliding with a nucleus in the Earth's upper atmosphere produces a muon that has a velocity $v=0.950c$. The muon then travels at constant velocity and lives 1.52μs as measured in the muon's frame of reference. (You can imagine this as the muon's internal clock.) How long does the muon live as measured by an Earth-bound observer?

2) **(3p.)** A particle is traveling through the Earth's atmosphere at a speed of $0.750c$. To an Earth-bound observer, the distance it travels is 2.50 km. How far does the particle travel in the particle's frame of reference?

3) **(4p.)** What is the momentum of an electron traveling at a speed $0.985c$? The rest mass of the electron is 9.11×10^{-31}kg.

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