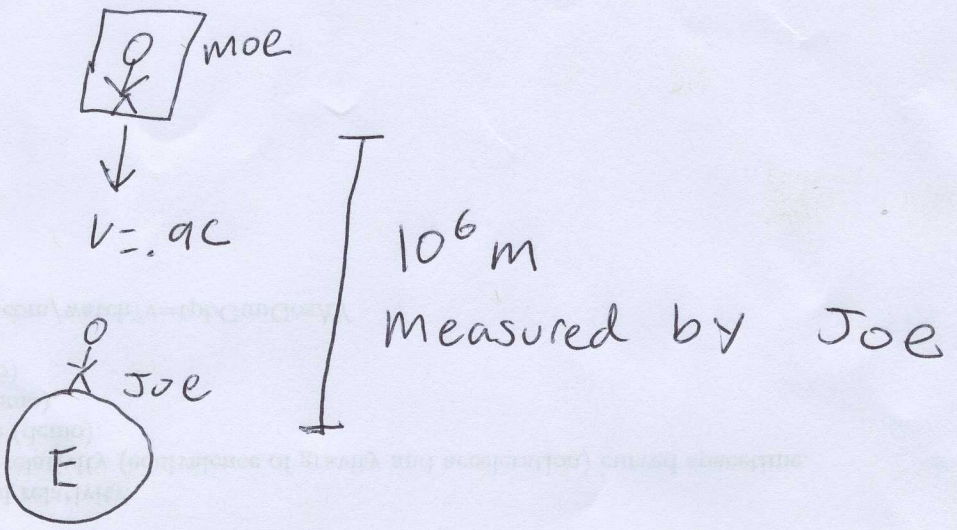
HW 4

(1) a)



b)

$$L_{moe} = L_{Joe}\sqrt{1-\frac{v^2}{c^2}} = L_{Joe}\sqrt{1-.81} \sim 4\times10^5 \text{ m}$$

To moe, Earth is approaching at .9c, hence the distance is contracted.

HW 4

(2) a) same as the previous figure but with different numbers.

b) $$100\ Km = (1000\ Km)\sqrt{1-\frac{v^2}{c^2}}$$

$$\frac{1}{100} = 1-\frac{v^2}{c^2}$$

$$\frac{v^2}{c^2} = \frac{100}{100} - \frac{1}{100} = \frac{99}{100}$$

$$v^2 = \frac{99}{100}c^2$$

$$\boxed{v = .995\ c}$$

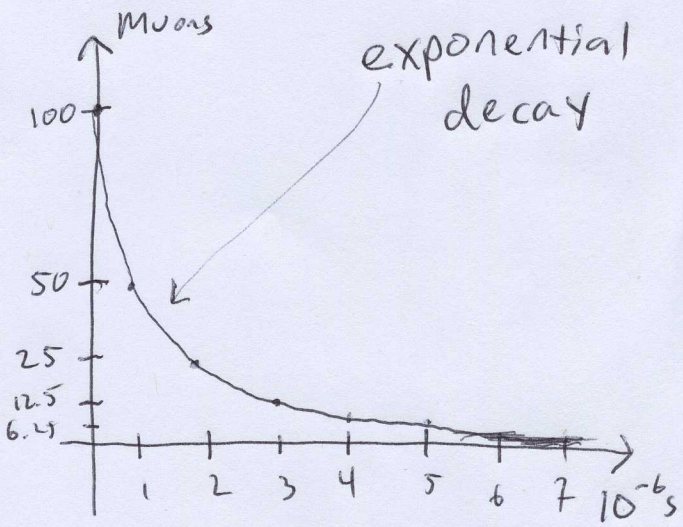
HW 4

(3) a) $\tau_\mu = 10^{-6}$ s

The half-life is the time, on average, for your muon supply to reduce by $\frac{1}{2}$.

Some points for the graph are

$(100, 0s)$
$(50, \tau_\mu)$
$(25, 2\tau_\mu)$
$(12.5, 3\tau_\mu)$
$(6.25, 4\tau_\mu)$
$(3.125, 5\tau_\mu)$



b) $V = .999c$

$$(\tau_\mu)_{Lab} = \frac{(\tau_\mu)}{\sqrt{1-\frac{v^2}{c^2}}} \approx 22\tau_\mu$$

$(100, 0s)$
$(50, 22\tau_\mu)$
$(25, 44\tau_\mu)$
$(12.5, 88\tau_\mu)$