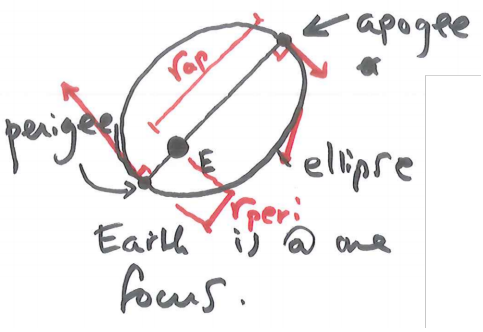
Name: _____ NetID: _____

NYU Physics I—Term Exam 6

Problem 1: For the elliptical orbit shown, roughly what is the eccentricity? (From Lecture on 2016-11-16.)



Problem 2: In the twin paradox, which twin ages more? The one on the geodesic, or the one who changes reference frames? (From Lecture on 2017-12-05.)

Problem 3: What is the speed of a package orbiting on a circular orbit right near the surface of the Earth? Give your answer in $\mathrm{m\,s^{-1}}$. (From Problem Set 11.)

Problem 4: Muons have a half-life of $2 \times 10^{-8}\,\mathrm{s}$ in their rest frame. When they are moving at a speed of $0.99\,c$ through the lab, what would their lab-frame (that is, time-dilated) half-life be? (From Problem Set 13.)

Problem 5: If the Earth were half as massive as it is, but were still on a near-circular orbit at its current Earth–Sun distance, how much longer or shorter would the year be? (From the recitation on orbits.)

Problem 6: What is the spacetime interval between the two events A and B?

$$A = (c\,t_A, x_A) = (1\,\mathrm{m}, 4\,\mathrm{m})$$

$$B = (c\,t_B, x_B) = (8\,\mathrm{m}, 2\,\mathrm{m})$$

Don't forget your units. (From the recitation on the interval.)