

Name: _____ NetID: _____

NYU Physics I—Term Exam 6

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

Problem 2: Sketch an orbit of roughly eccentricity 0.9. Most importantly: Show the point about which the object is orbiting, and make sure your perihelion and aphelion distances make sense. Don't worry about getting it all right, just roughly! (from Problem Set 12)

Problem 3: Draw a space-time diagram that shows a stationary base E (in the rest frame of E) and a ship S moving at speed $0.5c$ in the x direction with respect to E. At some time (your choice!) when the base and ship are far apart, base E sends a light signal to the ship S. Draw that light signal on your diagram too. (from Problem Set 13)

Problem 4: Earth orbits on a nearly circular orbit at 1 AU; Jupiter orbits on a nearly circular orbit at 5.2 AU. What is the semi-major axis of the transfer orbit that just kisses both of these orbits? (from lecture on 2018-11-27)

Problem 5: If you want to observe a time-dilated celebration (or, say, lifetime of some unstable particles), time dilated by a factor of 10, how fast does the party (or do the particles) have to move with respect to you? Give your answer in terms of the speed of light c . (from lecture on 2018-12-04)

Problem 6: What is the spacetime interval $(\Delta s)^2$ between the two events A and B ?

$$A = (ct_A, x_A) = (2 \text{ m}, 6 \text{ m})$$

$$B = (ct_B, x_B) = (7 \text{ m}, 3 \text{ m})$$

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