The diagram at right shows three possible orbits (1, 2, and 3) that a shuttlecraft follows around a planet, one orbit at a time. The three orbits are drawn to scale in the diagram.

Orbits 1 and 2 are circular; orbit 3 is elliptical.

Rank the three orbits according to each of the following quantities. Explain your reasoning in each case.

a. eccentricity of the orbit

b. total energy of the system consisting of the planet and the shuttle

c. angular momentum of the shuttle following that orbit (measured with respect to the center of the planet)