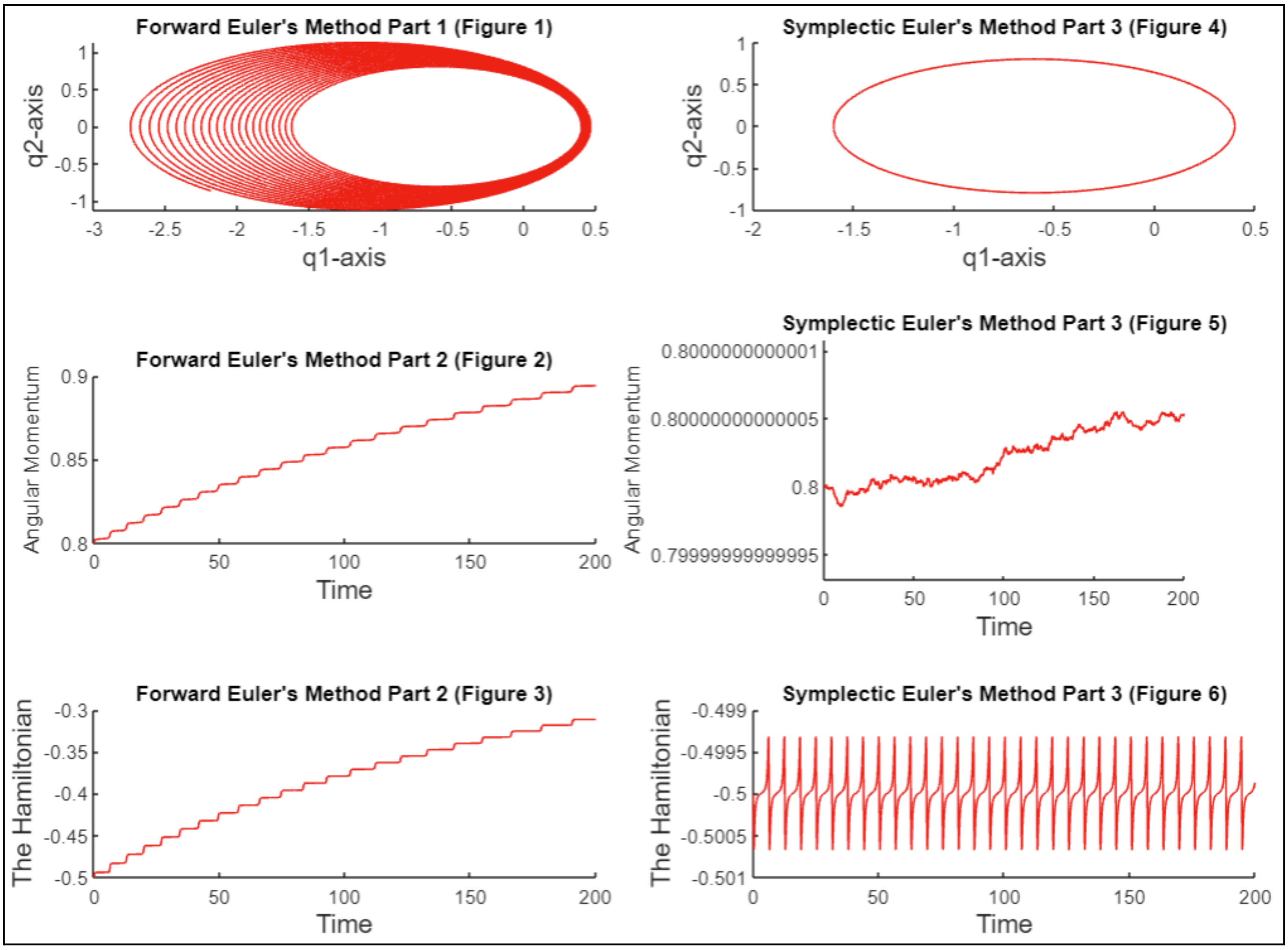

Briefly describe the qualitative behaviour of the numerical solution in part 1.

In figure 1, The q1 is our x-value and q2 is our y-value for the location of our moving planet. Because our graph in figure 1 is an outward spiral, our moving planet is spiraling outward away from our relatively fixed planet. Our two planets are circling around each other, and our graph is representing the movement of one planet relative to the other.

Does your numerical solution also conserve the angular momentum and Hamiltonian? If not, briefly comment on their behaviour for large t.

As seen by figure 2, the angular momentum is increasing and is therefore not conserved. As seen by figure 3, the Hamiltonian is increasing and is therefore not conserved. As t gets very large, the Hamiltonian and angular momentum get very large.

The Hamiltonian is the total internal energy of our planet. The Hamiltonian is a sum of the kinetic energy and the potential energy. The Hamiltonian is negative because the potential energy of the planet is negative. The potential energy of the planet is negative because zero potential energy occurs when a planet is out of the range of gravity.

Describe the behaviour of the numerical solution, and also the angular momentum and Hamiltonian.

In figure 3, our planet is orbiting perfectly without spiraling inward or outward. The angular momentum and Hamiltonian remain at 0.8 and -0.5 respectively (as seen in figure 5 and figure 6), and therefore are both conserved. Because everything remains constant, and no energy is created from nothing, we can conclude that symplectic Euler's method is more accurate than forward Euler's method for large t. The error in the graph for angular momentum is due to machine epsilon error, and the error we have in the Hamiltonian has occurred from symplectic Euler's method. Because the orbit is constant, the angular momentum and Hamiltonian remain constant. The Hamiltonian is negative for the same reason as mentioned in part 1.