Ep.1 Found a new planet

EAS3811 Space Mechanics

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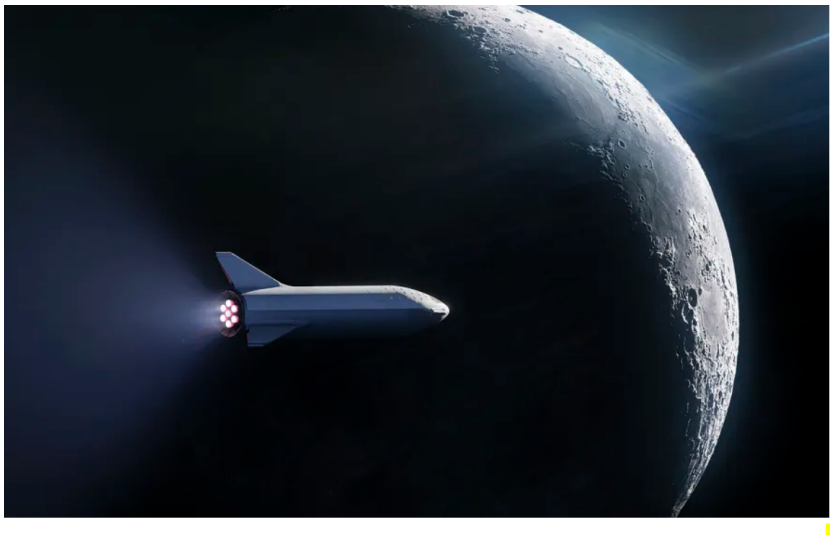

Figure 1: Your spacecraft is parked in an orbit of an unknown planet

Your spacecraft is orbiting a mysterious new planet. Using an external sensor, Your spacecraft dashboard indicates that the planet has a radius of approximately 5000 km. You are orbiting the planet T a constant distance of *500 km from the planet's surface* at a constant velocity of 8 km/s (a circular orbit). Since you are only there for a short time, you have not yet gone around the planet to know the period of your orbit. **1. Estimate the mass of the planet**.

You are planning to land on the planet. And one crucial information that you need to know is the gravitational acceleration of the planet on its surface (as a reference, gravitational acceleration of Earth on its surface is about 9.8 m/s^2). This is so that you can determine the weight of your rover once it lands on the planet. **2. Estimate the gravitational force g of the planet on its surface.**

The dashboard dings with a new notification. Your orbit around the planet is not a circular one as your distance from the planet changes over time. Your spacecraft's closest distance from the planet's center is about 5500 km; and the farthest distance is about 5700 km. **3. Find the eccentricity of your spacecraft new orbit. What type of orbit is it?**