MUST show all work and use MICROSOFT EQUATION EDITOR ONLY!!

Problem: A result of Kepler’s harmonic law is that the mass of a planet (M) with a satellite is directly proportional to the cube of the mean distance (d) from the satellite to the planet and inversely proportional to the square of the period of revolution )p). Early astronomers estimated the mass of the earth to be 5.976 x 1024 kg and observed that the moon orbited the earth with a period of 27.322 days at a mean distance of 384.4 x 103 km.

1. Write a formula for the mass of a planet according to Kepler.
2. Find the proportionally constant using the observations and estimates for the earth and moon.
3. Extend your knowledge across the solar system to find the mass of Mars based on observations that Phobos orbits Mars in 7.65 hours at a mean distance of 9330km.
4. What is the approximate ratio of the mass of the earth to the mass of Mars?

Concept Exercise: Given the above problem, provide written responses to address the following points as precisely and thoroughly as possible.

1. Explain the problem in your own words.
2. What mathematical concepts learned in this module apply to this problem?
3. Explain the steps you must take to solve this problem.
4. Explain exactly what the answer means from a mathematical perspective.