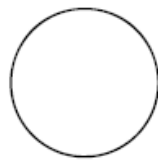


Universal Gravitation and Planetary Motion

As shown in the diagram below, a 1000 kg asteroid is located 6.8×10^6 m from the center of the Mars. The mass of the Mars is 6.4×10^{23} kg. Complete tasks I through VII either in the spaces provided or as instructed otherwise.



Mars



Asteroid

- I. Determine the force of gravity acting on the asteroid due to Mars and state its direction.
- II. Compare your answer in [I] to the force of gravity acting on the Mars, due to the asteroid. Indicate that force on the diagram above.
- III. On the diagram above, indicate the direction of the asteroid's acceleration. Label that vector "a".
- IV. Calculate the magnitude of the asteroid's acceleration.
- V. If instead of falling, the asteroid were in a stable orbit, indicate on the diagram above a possible direction of its speed. Label that direction "v".
- VI. Calculate the speed the asteroid needs to possess to remain in a stable orbit.
- VII. Calculate the period of the asteroid orbiting Mars [given the Kepler constant of our solar system as $3.35 \times 10^{18} \text{ m}^3/\text{s}^2$].