

Problem Set #3 part 2
(turn in as hard copy, on a separate sheet)

1. Pluto and Charon: Pluto and Charon orbit each other with a period of 6.4 days with a semimajor axis of 19.7×10^3 km. Calculate the combined mass of Pluto and Charon (ignore the other moon's of Pluto).

2. Mars's gravity: Mars has a diameter of 6780 km. It has two very small moons: 1) Phobos with an orbital period of 7.65 hrs and a semimajor axis of 9.38×10^3 km and 2) Deimos with an orbital period of 30.3 hrs and a semimajor axis of 23.5×10^3 km.
Calculate the acceleration due to gravity g_{Mars} at its surface and compare it to Earth's (9.8 m/s^2).

3. Momentum and Energy: An object of mass m_1 and velocity v_1 is directed at a stationary object of mass m_2 . After “colliding” with each other the objects “stick to each other” and travel as one with velocity v_{final} .

Note: Here “stick to each other” can mean “attached/glued to each other” or “orbit each other”.

- Use conservation of momentum to calculate the v_{final} .
- Calculate the total kinetic energy of the system before and after the collision (treat as one unit). Is energy conserved? Explain a process or possible processes for this result.

4. Constellations: Name and draw two constellations or asterisms (i.e., draw the principal stars, not the mythological character that it represents). Identify by name and location a star or stellar/celestial object that is located in or near each constellation.