Physics 167 – Astronomy

Homework #4

Chapter 7

1. Compare the surface area-to-volume ratios of
a. the Moon and Mars.
b. Earth and Venus.
In each case, use your answer to discuss differences in internal heat on the two worlds.

2. Just as the surface area-to-volume ratio depends on size, so can other properties. To see how, suppose that your size suddenly doubled; that is, your height, width, and depth all doubled. (For example, if you are 5 feet tall, you would become 10 feet tall.)
a. By what factor has your waist size increased?
b. How much more material will be required for your clothes? (Hint: Clothes cover the surface area of your body.)
c. By what factor has your weight increased? (Hint: Weight depends on the volume of your body.)
d. The pressure on your weight-bearing joints depends on how much weight is supported by the surface area of each joint. How has this pressure changed?

3. Imagine a planet, which we'll call Berth, orbiting a star identical to the Sun at a distance of 1 AU. Assume that Berth has eight times as much mass as Earth and is twice as large as Earth in diameter.
a. How does Berth's density compare to Earth's?
b. How does Berth's surface area compare to Earth's?
c. Based on your answers to (a) and (b), discuss how Berth's geological history is likely to have differed from Earth's.

4. Typical motions of one plate relative to another are 1 cm per year. At this rate, how long would it take for two continents 3000 km apart to collide? What are the global consequences of motions like this?

5. Briefly explain how the different atmospheric properties of Earth and Venus can be explained by the fundamental properties of size and distance from the Sun.