Dean Gadberry

NCTC PHYS 2425

February 27, 2024

Chapter 6 Homework

Questions

3. Will an object weigh more at the equator or at the poles? What two effects are at work? Do they oppose each other?

An object will weigh more at the poles than at the equator. The two effects are gravity and centripetal force. Centripetal force tangentially opposes gravity.

10. Would it require less speed to launch a satellite (a) toward the east or (b) toward the west? Consider the Earth's rotation direction, and explain your choice.

The Sun rises in the East and sets in the West. This zetetic phenomenon is a feature of the Earth spinning in the Easterly direction. Were the Earth some play-thing, objects released as it spins would tend to continue East. Thus, it would require less speed to launch a satellite (a) toward the east.

Misconception Questions

2. In the international Space Station which orbits Earth, astronauts experience apparent weightlessness because

(c) the astronauts and the station are in free fall towards the center of the Earth.

3. Which pulls harder gravitationally, the Earth on the Moon, or the Moon on the Earth? Which accelerates more?

(f) Both the same; the Moon.

6. As you travel away from Earth's surface,

(a) your weight decreases and your mass remains the same.

Problems

1. Calculate the force of Earth's gravity on a spacecraft 2.00 Earth radii above the Earth's surface if its mass is 1650 kg.

4. A hypothetical planet has a radius 2.5 times that of Earth, but has the same mass. What is the acceleration due to gravity hear its surface?

5. A hypothetical planet has a mass 2.80 times that of Earth, but has the same radius. What is g near its surface?

31. What will a spring scale read for the weight of a 58.0-kg woman in an elevator that moves...

(a) upward with constant speed 4.4m/s

(b) downward with constant speed 4.4m/s

(c) with an upward acceleration 0.18g

(d) with a downward acceleration 0.18g

(e) in free fall?

32. Astronomers using the Hubble Space Telescope deduced the presence of an extremely massive core in the distant galaxy M87, so dense that it could be a black hole (from which no light escapes). They did this by measuring the speed of gas clouds orbiting the core to be 780km/s at a distance of 60 light-years ($= 5.7 \times 10^{17} m$**) from the core. Deduce the mass of the core, and compare it to the mass of our Sun.**