Physics 20 Unit 2 - Gravity

Gravitational Field Strength on other Planets

Review:

The gravitational force on an object located $2r_{Earth}$ from the Earth's centre is 200 N. What is the gravitational force if the object is $10r_{Earth}$ from the Earth's centre?

ex) The force of gravity between two stars is *N* newtons. If the distance between the stars could be quartered, the mass of star 1 be doubled and the mass of star 2 be tripled, what would happen to the force of gravity between them?

$\vec{g}$ vs. G

Same letter: Big Difference

Define: $\vec{g}$

Define: G

While G is fixed throughout the universe, $\vec{g}$ can change.

This is similar to the idea of mass (always fixed) and weight (variable).

We can use this idea to determine some physics on different planets.

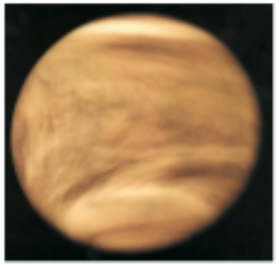
***Note: A helpful data table of planetary info is on page 218 of your text.**

Sidenote: What happened to Pluto?

- Pluto was considered a planet from it's discovery in 1930 until 2006.
- In 2006, the International Astronomical Union redefined the term "planet" and classified Pluto as a "dwarf-planet", along with Eris, a newly discovered scattered-disk.

Conceptual Example:

What is the weight of a 90 kg a man on Venus?



Step 1: Find the field strength on Venus. Take values from your data table in the text.

Alternatively:
Use Newton's Law of Universal Gravitation

Step 2: Use Newton's Second Law to work out the weight.

ex) What is the gravitational field strength on the planet Jupiter?

ex) What is the gravitational field strength on the planet Mercury?

The field strength on Earth is also not fixed; it depends on two factors:

1. Altitude: How high above the surface of the Earth an object is placed (recall calculation of field strength on Everest).

2. Latitude: A measure of North and South from the equator.

Question: Why might latitude effect field strength?

exaggeration

Because of its rotation, the earth is not actually a perfect sphere. It is a geoid, slightly bulging around the equator.

The earth is around 21 km wider in radius at the equator than at the poles.

Of course, the Earth isn't perfectly smooth either: it has mountains (Everest: 8848 m) and trenches (Mariana trench: 10911 m).

But, compared to it's massive radius, these imperfections seem small. It has a smaller tolerance for smoothness than a standard billiards ball.