Gravitational Field Strength I

Take $G = 6.67 \times 10^{-11}$ N m^2 kg^{-2}, where necessary.

1. Define gravitational field strength

2. Show that the units of gravitational field strength are equivalent to those of acceleration.

3. Calculate the gravitational field strength on the surface of the Earth, if the radius of the Earth is 6.4×10^6 m, and the mass of the Earth is 6.0×10^{24} kg.

4. A planet has a radius of 8.0×10^7 m and a mass of 7×10^{26} kg. Calculate the gravitational field strength at
   - (i) the surface
   - (ii) twice the radius
   - (iii) three times the radius
   - (iv) four times the radius

   (a) Sketch a graph showing how the gravitational field strength varies from the centre of the planet to a distance from the planet equal to four planetary radii. Include a scale on your graph.

5. The gravitational field strength on the moon is 1.7 N kg^{-1}. Assuming that the moon is a uniform sphere of radius 1.74×10^6 m, calculate
   (a) the mass of the moon
   (b) the gravitational field strength 1.0×10^6 m above its surface.

6. A man is able to jump vertically 1.5m on Earth. What height should he be able to jump on a planet of one third of the density of the Earth and one half of its radius.