Worksheet 5.4 – Gravitational Field Strength

G = 6.67 × 10-11 N m2 kg-2, mass of the Earth = 6.0 × 1024 kg, Radius of the Earth = 6.4 × 106 m.

1. Calculate the gravitational field strength on the surface of the earth.
2. Calculate the gravitational field strength Mr. Lawson would generate if he had the same radius of the Earth. (Oh by the way I weigh 80.0 kg)
3. Based on your answers to Q 1 and 2… explain why the Earth and I exert the SAME force on one another…
4. Calculate the gravitational field strength on the surface of Mars. Mars has a radius of 3.43x106 m and a mass of 6.37x1023 kg.
5. At what distance from Earth’s surface is the acceleration due to gravity 7.33 m/s2?
6. On the surface of Planet X an object has a mass of 22.5 kg and a weighs 63.5 N. What is the gravitational field strength on the surface?
7. On the surface of Planet Y, which has a mass of 4.83x1024 kg, a 30.0 kg object weighs 50.0 N. What is the radius of the planet?

Answers:

1. (9.8 m/s2 duh…)
2. (1.3 x 10-22 m/s2)
3. the actual force acting on an object at a point in a field is the product of the field strength and the mass of the object placed there. This product is the same in both situations
4. (3.61 N/kg)
5. (9.97x105 m)
6. (2.82 N/kg)
7. (1.39x107m)