13 Newton's law of gravitation – Part 2 —Answers

Answers

Work through these after trying the questions yourself.

13.1 $F = Gm_1m_2/r^2$.

13.2 It falls to a quarter (inverse-square law).

13.3 The universal gravitational constant.

13.4 $F = \dfrac{(6.67 \times 10^{-11})(3000)(3000)}{2.0^2} = \dfrac{6.0 \times 10^{-4}}{4} = 1.5 \times 10^{-4}$ N.

13.5 A point mass with all its mass at its centre.

13.6 Gravitational force depends on mass, and the Earth's mass is enormous, so its pull is large. A mountain's mass is tiny by comparison, and G is very small, so its pull is far too weak to notice.

13.7 $g = GM/r^2$, so $g \propto M/r^2$. Doubling M multiplies by 2; doubling r divides by $2^2 = 4$. Net: $g_X = \frac{2}{4} = \frac{1}{2}$ of the Earth's —about half.