

GRAVITATIONAL FIELDS COLLABORATIVE PROBLEM

1. A satellite, with a mass of 225 kg, experiences a force of gravity due to Earth equal to 399 N. Find the height of the satellite above the surface of the Earth.

$$m = 225 \text{ kg}$$

$$F_g = 399 \text{ N}$$

$$h = ?$$

$$r_E = 6.38 \times 10^6 \text{ m}$$

$$M = 5.98 \times 10^{24} \text{ kg}$$

$$F_g = \frac{GmM}{r^2}$$

$$F_g = \frac{GmM}{(r_E + h)^2}$$

$$(r_E + h)^2 = \frac{GmM}{F_g}$$

$$r_E + h = \sqrt{\frac{GmM}{F_g}}$$

$$h = \sqrt{\frac{GmM}{F_g}} - r_E$$

$$h = \sqrt{\frac{(6.67 \times 10^{-11} \frac{\text{Nm}^2}{\text{kg}^2})(225 \text{ kg})(5.98 \times 10^{24} \text{ kg})}{399 \text{ N}}} - 6.38 \times 10^6 \text{ m}$$

$$h = 18617480.991 \text{ m}$$

$$h = 18.6 \times 10^6 \text{ m}$$