

22. (a) The radiation pressure produces a force equal to

$$\begin{aligned} F_r &= p_r(\pi R_e^2) = \left(\frac{I}{c}\right)(\pi R_e^2) \\ &= \frac{\pi(1.4 \times 10^3 \text{ W/m}^2)(6.37 \times 10^6 \text{ m})^2}{2.998 \times 10^8 \text{ m/s}} = 6.0 \times 10^8 \text{ N} . \end{aligned}$$

- (b) The gravitational pull of the Sun on Earth is

$$\begin{aligned} F_{\text{grav}} &= \frac{GM_s M_e}{d_{es}^2} \\ &= \frac{(6.67 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2)(2.0 \times 10^{30} \text{ kg})(5.98 \times 10^{24} \text{ kg})}{(1.5 \times 10^{11} \text{ m})^2} \\ &= 3.6 \times 10^{22} \text{ N} , \end{aligned}$$

which is much greater than  $F_r$ .