$$F_g = m_1 g = \frac{G m_1 m_2}{r^2}$$

$$g = \frac{G M_\oplus}{r^2}$$

$$g = G M_\oplus \frac{1}{r^2} \rightarrow g \propto \frac{1}{r^2}$$

$$g r^2 = 1$$

$$g = \frac{1}{r^2}$$

$$g' R^2 = 1$$

$$g' = \frac{1}{R^2}$$

$$gr^2 = g'R^2 \rightarrow \frac{g}{2}$$

$$\frac{gr^2}{g'} = R^2 \hookrightarrow g' = \frac{gr^2}{R^2}$$

$$\frac{1}{2} = \frac{r^2}{R^2} \qquad \frac{g}{2} = \frac{gr^2}{R^2}$$

$$R^2 = 2r^2$$

$$R = \sqrt{2r^2} \rightarrow \sqrt{2}\,r_\oplus$$

$$R = r_\oplus + h$$

$$r_\oplus + h = \sqrt{2}\, r_\oplus$$

$$h = \sqrt{2}\, r_\oplus - r_\oplus$$

$$h = r_\oplus \left(\sqrt{2} - 1\right)$$