80. (a) Taking the differential of $F = GmM/r^2$ and approximating dF and dr as ΔW and $-h$, respectively, we arrive at

$$\Delta W = \frac{2GMmh}{r^3} = \frac{2G\left(4\pi\rho r^3/3\right)mh}{r^3}$$

where in the last step we have used the definition of average density ($\rho = M/V$ where $V_{\text{sphere}} = 4\pi r^3/3$). The above expression is easily simplified to yield the desired expression.

(b) We divide the previous result by $W = mg$ and obtain

$$\frac{\Delta W}{W} = \frac{8\pi G\rho h}{3g} \ .$$

We replace the lefthand side with 1×10^{-6} and set $\rho = 5500\,\text{kg/m}^3$, and obtain $h = 3.2$ m.