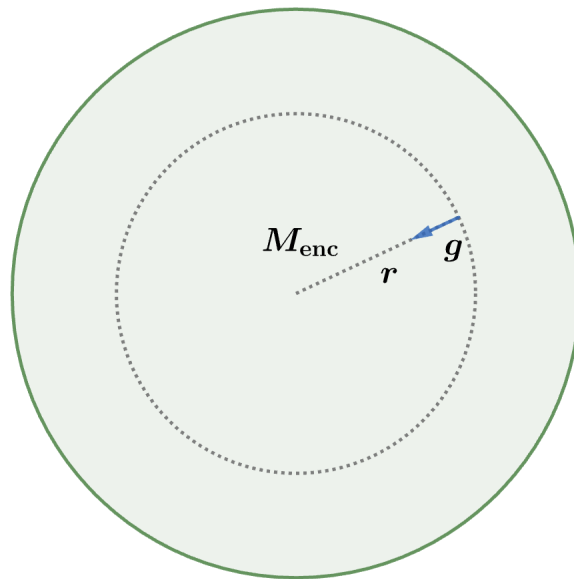# 2019B F=ma Exam: Problem 5

Kevin S. Huang

Recall from the shell theorem that the gravitational acceleration inside a uniform sphere is given by

$$mg = \frac{GM_{\text{enc}}m}{r^2}$$

where

$$M_{\text{enc}} = \frac{4}{3}\pi r^3 \rho$$

so

$$g = \frac{4\pi}{3}G\rho r$$
$$g \propto r$$

Since the density of the Earth decreases with r, g must grow slower than linear in r so the answer is E.