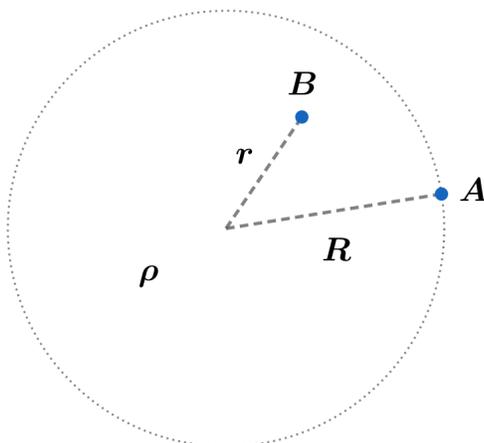# 2019A F=ma Exam: Problem 21

Kevin S. Huang

Recall for a circular orbit,

$$\frac{GMm}{d^2} = \frac{mv^2}{d}$$

$$v = \sqrt{\frac{GM}{d}}$$

Since $M_{enc} \propto d^3$ for uniform density ρ,

$$v \propto \sqrt{\frac{M_{enc}}{d}} \propto \sqrt{\frac{d^3}{d}} = d$$

Since $R > r$, we have

$$v_A > v_B$$

We have

$$T = \frac{2\pi d}{v}$$

and since $v \propto d$ from above,

$$T_A = T_B$$

so the answer is $\boxed{E}$.