2020B F=ma Exam: Problem 13

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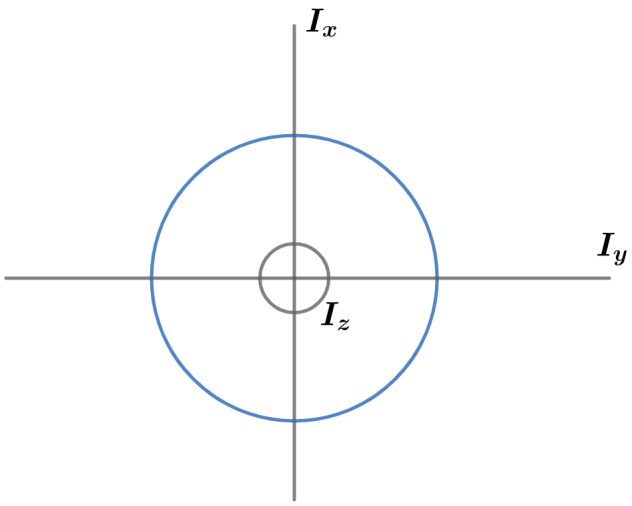
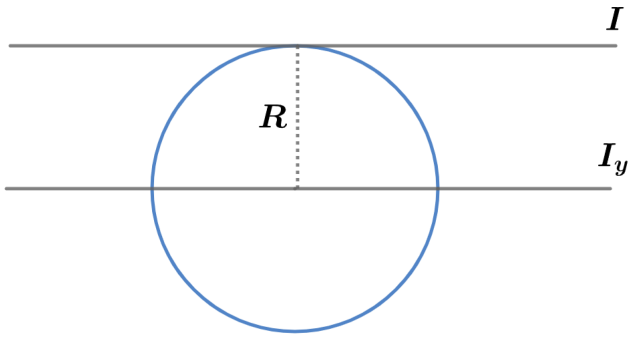


By the perpendicular-axis theorem, we have

$$I_z = I_x + I_y = 2I_y$$

Since $I_z = \frac{1}{2}MR^2$,

$$I_y = \frac{1}{4}MR^2$$



By the parallel-axis theorem,

$$I = I_y + MR^2 = \frac{5}{4}MR^2$$

Recall the period of oscillation of a physical pendulum is given by

$$T = 2\pi\sqrt{\frac{I}{mgd}}$$

where d is the distance from the center of mass to the pivot. In our case,

$$T = 2\pi\sqrt{\frac{(5/4)MR^2}{MgR}} = \pi\sqrt{\frac{5R}{g}}$$

so the answer is $\boxed{\text{B}}$.