



$$\begin{aligned}
 I_{xx} &= \frac{1}{2} m_2 r_2^2 - \frac{1}{2} m_1 r_1^2 \\
 &= \frac{1}{2} (\rho \pi r_2^2 l) r_2^2 - \frac{1}{2} (\rho \pi r_1^2 l) r_1^2 \\
 &= \frac{1}{2} \rho \pi l (r_2^4 - r_1^4) = \frac{1}{2} \rho \pi l \underbrace{(r_2^2 - r_1^2)}_m (r_2^2 + r_1^2) \\
 &= \underline{\underline{\frac{1}{2} m (r_2^2 + r_1^2)}}
 \end{aligned}$$