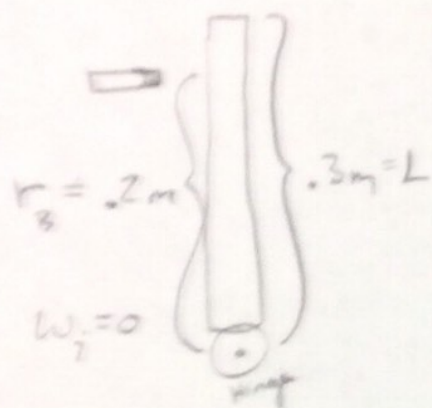


Angular Momentum WS 2

1. A .007 kg bullet traveling horizontally with a speed of 500 m/s hits and embeds itself in a 20 kg door.



- a) At what angular speed does the door swing open after the collision?

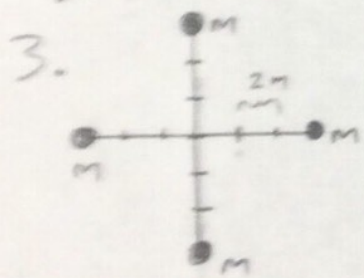
$$I_{\text{door}} = \frac{1}{3} M_{\text{door}} L^2 \quad I_{\text{bullet}} = m r^2$$

- b) How much energy became heat?

$$K_{\text{rot.}} = \frac{1}{2} I \omega^2 \quad K_{\text{trans.}} = \frac{1}{2} m v^2$$

2. An asteroid moves around a distant star with its closest approach being 1 million meters and its greatest distance being 100 million meters.

If its closest approach speed is 70,000 m/s, what is its speed when it is farthest away?



The system of small masses (each 6m from the axis of rotation) is rotating at angular speed 3 rad/s . The masses are connected by massless spokes that can be lengthened or shortened. What is the new angular speed if spoke length is $\frac{1}{3}$ the original?

4. A playground has a merry-go-round of radius 3 meters with a moment of inertia of 300 kg m^2 and is rotating on a frictionless axle. A child of mass 30 kg stands a distance of 2 meters from the axle, the system rotates at 15 revolutions per minute. If the child walks to the very edge of the merry-go-round, what would be the new angular speed of the child and merry-go-round system? How much energy becomes heat as a result?