Announcements

- Homework 10 has been posted! But not due on Monday!
- Everyone should have gotten an email from me with their Final Chapter question. If you did not, let me know pronto!
- Responses: `rembold-class.ddns.net`

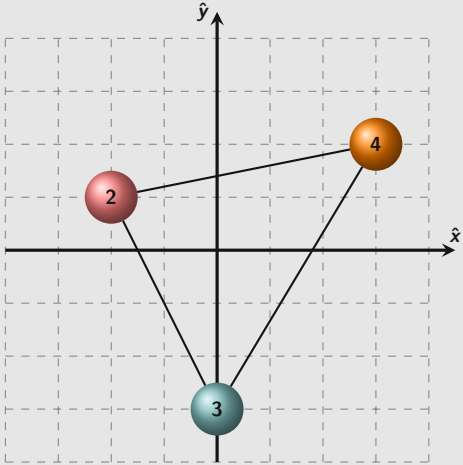
Today's Objectives

- Understand in what situations we get the angular momentum pointing in a different direction than the rotation vector
- Be able to describe why we can not limit ourself to just a single axis, even if we are free to make that axis whatever we choose
- Calculate inertial tensors for discrete and continuous mass distributions
- Be able to relate the inertial tensor back to the angular momentum of a rigid body
- Introduce the idea of primary axes and understand why they could be useful

Q1

What is the y-component of the total angular momentum of the system of masses arranged in the triangle to the right as it rotates about the z-axis (coming out of the screen)? You know that $\vec{\omega} = 10\hat{\boldsymbol{z}}$.

A) 80
B) -80
C) 0
D) 10



Q2

A two mass system rotates about the origin with $\vec{\omega} = (0, 1, 1)$ rad/s. Both masses are equal. Which of the below initial positions of the masses would result in the angular momentum of the system not being in the same direction as $\vec{\omega}$?

A) $r_1 = (0, 0, 2)$
$r_2 = (0, 2, 0)$

B) $r_1 = (0, 1, -1)$
$r_2 = (-\sqrt{2}, 0, 0)$

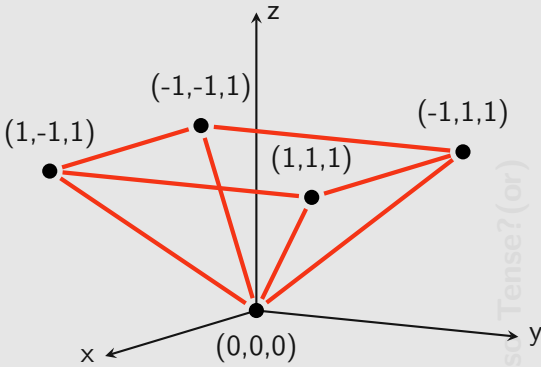
C) $r_1 = (0, 1, -1)$
$r_2 = (0, -2, 2)$

D) $r_1 = (0, -2, 0)$
$r_2 = (0, 2, 0)$

Q3

What is the I_{xx} component of the inertial tensor for the below configuration of masses about the tip of the pyramid? You can assume all masses are 2 kg.

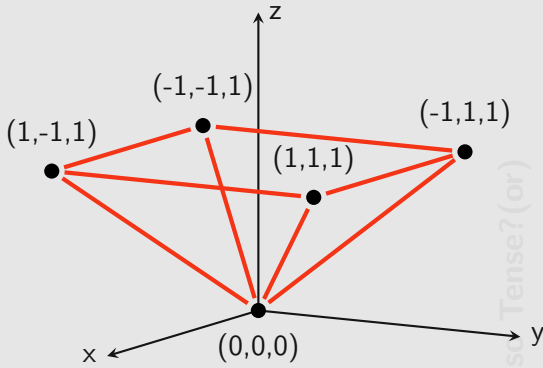
A) 9.6
B) 16
C) 18.3
D) None of the above



Q4

What is the I_{xx} component of the inertial tensor for the below configuration of masses if it is rotating about its center of mass? You can assume all masses are 2 kg.

A) 9.6
B) 16
C) 18.3
D) None of the above



Q5

The total inertial tensor for the mass distribution to the right about the point is:

$$\vec{\mathbf{I}} = \begin{bmatrix} 16 & 0 & 0 \\ 0 & 16 & 0 \\ 0 & 0 & 16 \end{bmatrix}$$

What is the angular momentum of the system if it is spun about $\vec{\omega} = (1, 1, 0)$?

A) (16,16,0)

B) (16,0,16)

C) (0,16,16)

D) None of the above