Announcements

- Homework 10 not due the coming Monday, but the Monday after
- I am ONE QUESTION from having the Midterms all graded. Should be done by this evening.
- CompDay on Monday will be on computing inertial tensors with Python and Sympy
- Don't forget to start thinking/reading through your Final Chapter!
- Responses: rembold-class.ddns.net



Today's Objectives

- Understand why principal axes are useful
- Be able to compute moments of inertia about a primary axis
- Be able to determine the principal axis of some given mass distribution
- Understand how to use principal axes to reason about the spinning motion of a mass distribution.





Consider a mass distribution that when rotated about its center of mass yields the following inertial tensor:

$$\vec{\mathbf{I}} = \begin{bmatrix} 4 & 0 & 2 \\ 0 & 4 & 0 \\ 2 & 0 & 4 \end{bmatrix}$$

in the standard Cartesian coordinate basis. Which axis would be a principal axis?

- A) The x axis
- B) The y axis
- C) The z axis
- D) None of the above



Taking the same inertial tensor as the last question, all of the following values are the moment of inertia about a principal axis except one. Which of the following is NOT a moment of inertia about a principal axis?

$$\vec{\mathbf{I}} = \begin{bmatrix} 4 & 0 & 2 \\ 0 & 4 & 0 \\ 2 & 0 & 4 \end{bmatrix}$$



We already know that the moment of inertia about the \hat{y} principal axis is 4. But which principal axis corresponds to the moment of inertia of 6?

$$\vec{\mathbf{I}} = \begin{bmatrix} 4 & 0 & 2 \\ 0 & 4 & 0 \\ 2 & 0 & 4 \end{bmatrix}$$

A)
$$\frac{1}{\sqrt{2}} \begin{bmatrix} 1\\1\\0 \end{bmatrix}$$

B)
$$\frac{1}{\sqrt{2}}\begin{bmatrix} 1\\0\\-1 \end{bmatrix}$$
 C) $\frac{1}{\sqrt{2}}\begin{bmatrix} 1\\0\\1 \end{bmatrix}$

C)
$$\frac{1}{\sqrt{2}}\begin{bmatrix} 1\\0\\1 \end{bmatrix}$$

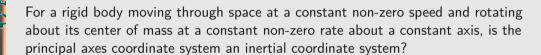
$$\begin{array}{c} \mathsf{D}) \ \frac{1}{\sqrt{2}} \begin{bmatrix} \mathsf{0} \\ \mathsf{1} \\ -\mathsf{1} \end{bmatrix}$$

MECHANICS

- A) It would be larger
- B) It would be smaller
- C) It would be the same
- D) It will depend on the rate of rotation



MECHANICS



- A) Yes!
- 3) No!
- C) Sometimes!
- D) I have no clue what is happening!

