PHYS 1443 – Section 003
Lecture #18

Monday, Nov. 10, 2002
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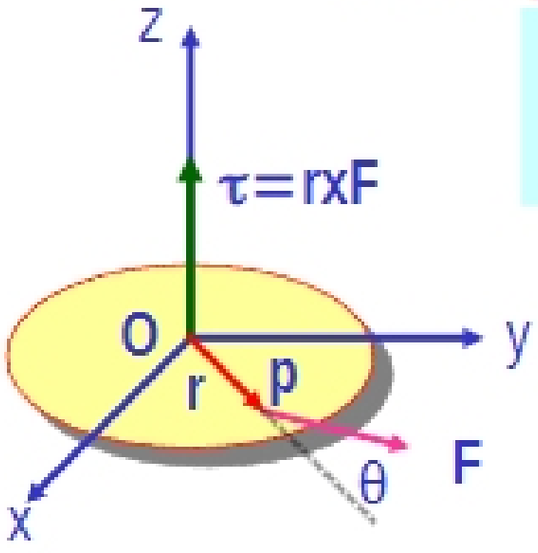
1. Torque and Vector Products
2. Rotational Kinetic Energy
3. Work, Power and Energy in Rotation
4. Angular Momentum
5. Angular Momentum and Torque
6. Conservation of Angular Momentum

Announcements

- 2nd term exam changes
  - Problem #7, the correct answer is c, 0.6.
    - ✂➔ Those who answered b and c get credit
  - Problem #21, there is no correct answer
    - ✂➔ All of you received credit for this problem
- Class average: 52.1 (term 1: 53)
  - The two exams are identical in average

Torque and Vector Product



Let's consider a disk fixed onto the origin O and the force **F** exerts on the point p. What happens?

The disk will start rotating counter clockwise about the Z axis

The magnitude of torque given to the disk by the force **F** is

$$\tau = Fr\sin\phi$$

But torque is a vector quantity, what is the direction?
How is torque expressed mathematically?

$$\vec{\tau} \equiv \vec{r} \times \vec{F}$$

What is the direction? The direction of the torque follows the right-hand rule!!

The above quantity is called
Vector product or Cross product

$$\vec{C} \equiv \vec{A} \times \vec{B}$$

$$\left|\vec{C}\right| = \left|\vec{A} \times \vec{B}\right| = \left|\vec{A}\right|\left|\vec{B}\right|\sin\theta$$

What is the result of a vector product? Another vector

What is another vector operation we've learned? Scalar product

$$C \equiv \vec{A} \cdot \vec{B} = \left|\vec{A}\right|\left|\vec{B}\right|\cos\theta$$

Result? A scalar