PHYS 111
HOMEWORK #13

Due : 3 pm Friday, 9 Dec. 2016

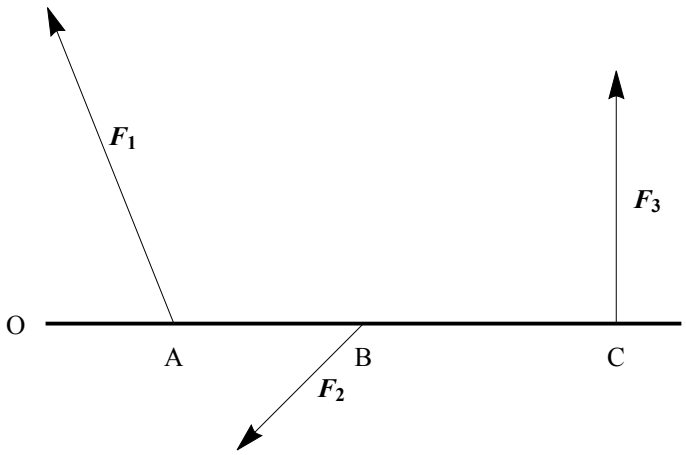
This is an optional homework assignment. If you wish to receive credit for this assignment, turn it in to my office by 3 pm this Friday. Your score on this homework will replace your lowest non-zero homework score (this will not replace a homework you did not turn in or for a homework where you received a zero for academic dishonesty.) Since this material will be covered on the final, I urge all students to attempt these problems, and study carefully the solutions which will be posted at 3 pm on Friday.

1. A billiard ball moving across a pool table at a speed of 1.5 m/s makes a head on collision with an identical ball. Find the speed of each ball after collision if : a) the second ball is initially at rest; b) the second ball is moving toward the first ball at 1 m/s; c) the second ball is moving away from the first ball at 1 m/s. (5 pts each part). Assume all collisions are elastic.

2. Squids propel themselves by ingesting water and squirting it out (essentially a jet propulsion mechanism.) Suppose a 100 kg giant squid (they actually grow larger than this) is initiall at rest in the ocean. It ingests 10 kg of water which it then expels backward at a speed of 10 m/s. What will be the forward speed of the squid?

3. Consider a merry go round whose moment of inertia around its rotational axis is 100 kg m . While the merry go round is at rest, a child of mass 30 kg runs tangential to the outer edge at a speed of 5 m/s and then jumps on. a) What is the moment of inertia of the merry go round/child system once the child has jumped on? b) What is the angular velocity of the system once the child has jumped on? (10 pts each part).

4. Consider the diagram below :



Three forces act on a plank as shown above. F_1 has a magnitude of 40N, F_2 has a magnitude of 20N, and F_3 has a magnitude of 30N. The distances of A, B and C from O are, respectively, 2m, 5m and 9m. F_1 and F_2 make angles of 45^o with respect to the plank. Find the torques generated by each force around O, and the direction and magnitude of total torque.

5. Use the diagram for question 12 on p. 314. Consider a mass m hanging from a string attached to a solid cylindrical wheel of mass M and radius R. If the system is released from rest, find the accleration of the stone, the tension in the wire, and the angular acceleration of the wheel.

6. Use energy methods to find the speed of the mass after it has fallen a height h.

7. Problem 22, p. 314.

8. Problem 23, p. 315.

9. Problem 29, p. 315.

10. Problem 41, p. 316

11. Problem 45, p. 316