

Physics 111 Session 16

- 1) A car's tire weighs 20 kg, and has a radius of 25 cm. If the car accelerates from 0 m/s to 30 m/s in 5.6 seconds,
 - a) What is the car's acceleration?
 - b) Find the tire's angular velocity at $t=2.0$ seconds, and at $t=5.6$ seconds
 - c) What is the tire's angular acceleration?
 - d) What is the total kinetic energy of the tire? (assume the tire is cylindrical, $I = \frac{1}{2}mr^2$)
- 2) A block that has mass 8kg compresses a spring with force constant 4,000 N/m by 20 cm. If there is no friction, what is the speed of the block when it is released?
- 3) A propeller on an airplane has radius 0.4m, and spins at 180 rad/s. What is the centripetal acceleration of the tip of the propeller?
- 4) In an inelastic collision, what is conserved?
 - a) Kinetic energy
 - b) Momentum
 - c) Both
 - d) neither
- 5) A baseball is thrown with spin. Its mass is 0.5kg and its moment of inertia is 0.01 kgm². If it is thrown at 35 m/s with angular velocity 50 rad/sec, what is its total energy?
- 6) A 3kg mass is being pulled up an inclined plane by a force of 10N. if the plane is at a 30-degree angle from the horizontal, the displacement is 0.7m, and the coefficient of kinetic friction is 0.25, what is the work done by the force?
- 7) An amusement park ride consists of a horizontal circle of radius 6m, that is spun from rest to 1.2 rad/s in 24 seconds. What is the tangential acceleration of the passengers during this time?
- 8) In an inelastic collision, 2 hockey pucks ($m=0.15$ kg) collide. The first one is going at $\langle 8\text{m/s } x, -6\text{m/s } y \rangle$, and the second one is going at $\langle -4\text{m/s } x, 7\text{m/s } y \rangle$. After the collision, the first puck is going $\langle 5\text{m/s } x, 2\text{m/s } y \rangle$. What is the final velocity of the second puck?
- 9) What is the center of mass of the objects in the diagram to the right?

