1. Previously this semester, we solved the problem of a “loop the loop” in which we determined the minimum release height for an object to make it around a loop of radius R. In that, we neglected the rotational kinetic energy of the object. Repeat the derivation but assume the object is a ball of mass m and radius r.

2. A star with a radius of $7x10^5$ km collapses into a neutron star with a radius of 16 km. The original star had a rotational period of 30 days. What is the rotational period of the neutron star?

3. A Canada goose with a mass of 7 kg is flying at a speed of 5 m/s. It smacks into one of the blades of a wind turbine, which kills it instantly, resulting in goose goo becoming stuck to the blade. The turbine can be considered to be a solid disk with a diameter of 3 m and a mass of 13 kg. It original angular speed was 5 rad/s. By how much will the rotational speed of the blade be changed by the impact? (Hint: This problem is intentionally ambiguous in a key feature.)

4. A bear with a mass of 147 kg stands on a frozen pond. He can be considered to be a cylinder with a radius of 30 cm. A wolverine leaps out of the surrounding woods and strikes the bear and hangs on with his sharp claws. The wolverine's mass is 17 kg and its initial speed is 7.1 m/s prior to striking the bear. What is the rotational speed of the bear after the impact?