Gyroscope Investigation

1. You will need a gyroscope, a gear puller, a gyroscope stand, and a love for rotational mechanics.

2. Get the gyroscope spinning by using the gear puller. Hold the gyroscope firmly, and pull the handle - being careful not to strip the little teeth. Play with it over a table. If it drops on the floor it will break. Come up with a stupid gyroscope trick.

3. Get the gyroscope spinning anti-clockwise as seen from above (This way the L vector is pointing up), put the bottom of the gyro into stand Note carefully which way the gyroscope precesses.

4. **Draw careful diagrams** that a) show the direction of the torque on the gyroscope (Due to gravity) the axis about which this torque acts is the stand Γ = r x F, so r is away from the stand, F is straight down, b) show the direction of the angular momentum vector, c) show that the direction of precession has the tip of the L vector going in the direction of the torque.

5. Answer these questions:

A. Measure the mass of the rotor by weighing the gyroscope, and subtracting the 23.5 grams that is the cage. Measure the radius of the rotor, and use a formula like I = mr2 (or is it .9mr2? – feel free to make your own formula) to **find the moment of inertia of the rotor in kgm2**.

B. The axle has a diameter of 3.9 mm (0.0039 m). Supposing the puller was moving about 1.5 m/s at the end of your pull,

1. **calculate the angular velocity of the gyro**, (use v = ωr) and

2. **calculate the angular momentum of the gyro**. (L = Iω)

C. Calculate the **angular momentum of the earth** (L = Iω). (use the interwebs to find the mass, radius, and period of rotation. Assume the earth is a sphere (2/5mr2). ω = 2π/T. You can also just go to wolfram alpha and type “angular velocity of the earth”) Show that it is about 7x1033 kgm2/s (be a bit more exact)

6. Leave your gyroscope exactly the way you found it.

Here’s what you turn in:

1. The diagram as explained in part 4.

2. The answers for part 5.