PHYS 211: Problem Set 3

May 30, 2012

1. A car travels a distance of 10mi. If the diameter of the wheels is 20in, how many rotations does the wheel make?

2. Three masses of 3 kg each are stuck to a long weightless rod or length 2m at 0.5m, 1m, and 1.5m from one end. The rod is then attached to a motor at its midpoint and spun around in a horizontal plane. If the motor provides a torque of 5Nm, how long does it take for the rod to spin at 20rpm?

3. You are riding a motorcycle on a ramp inclined at 10° to the horizontal at 100mph. At the end of the ramp you launch off, and you're going to land on a horizontal road. If you want to land and continue rolling without slipping, will you increase or decrease your wheel speed in mid-flight? Assume there is no significant rotation of the motorcycle and that you land on the back wheel.

4. A motor is wrapping tape on a spool of radius 2cm. It turns at 30rpm. If the tape has a thickness of 0.1mm, how long does it take to wrap 50m of it.

5. I launch a knife into the air by holding it at its handle and throwing it straight up with some spin. If I throw it up with a speed of 1m/s, what minimum angular velocity should I give it so that when it comes back down I can catch it by the handle. Assume I don't move my hand during the process.