Practice Problem Set 8

1. (From the past final 2010) A particle of mass *m* collides with a second particle of mass *M* (>*m*) which is initially at rest. In the collision, which may be assumed to be perfectly elastic, the first particle is deflected through a right angle. Show that its speed is reduced by a factor $\sqrt{\frac{M-m}{M+m}}$ by the collision (i.e. $\frac{v_{1f}}{v_{1i}} = \sqrt{\frac{M-m}{M+m}}$). Discuss the case where *M* = *m*.

2. (Chapter 9, Q31) Two identical trucks have mass 5500kg when empty, and the maximum permissible load for each is 8000 kg. The first truck, carrying 3800 kg, is at rest. The second truck plows into it at 65 km/h, and the pair moves away at 27 km/h. As an expert witness, you are asked to determine whether the second truck was overloaded. What do you report?

3. (Chapter 10, Q10) Determine the angular speed, in rad/s, of (a) Earth about its axis; (b) the minute hand of a clock; (c)the hour hand of a clock; and (d) an eggbeater turning at 300 rpm.