184. A 2150 kg car, moving east at 10.0 m/s, collides and joins with a 3250 kg car. The cars move east together at 5.22 m/s. What is the 3250 kg car's initial velocity?

185. Find the change in kinetic energy in problem 184.

186. A 15.0 g toy car moving to the right at 20.0 cm/s collides elastically with a 20.0 g toy car moving left at 30.0 cm/s. The 15.0 g car then moves left at 37.1 cm/s. Find the 20.0 g car's final velocity.

187. A remora swimming right at 5.0 m/s attaches to a 150.0 kg shark moving left at 7.00 m/s. Both move left at 6.25 m/s. Find the remora's mass.

188. A 6.5×10^{12} kg comet, moving at 420 m/s, catches up to and collides inelastically with a 1.50×10^{13} kg comet moving at 250 m/s. Find the change in the comets' kinetic energy.

189. A 7.00 kg ball moves east at 2.00 m/s, collides with a 7.00 kg ball at rest, and then moves 30.0° north of east at 1.73 m/s. What is the second ball's final velocity?

190. A 2.0 kg block moving at 8.0 m/s on a frictionless surface collides elastically with a block at rest. The first block moves in the same direction at 2.0 m/s. What is the second block's mass?

Chapter 7 Circular Motion and Gravitation

191. A pebble that is 3.81 m from the eye of a tornado has a tangential speed of 124 m/s. What is the magnitude of the pebble's centripetal acceleration?

192. A race car speeds along a curve with a tangential speed of 75.0 m/s. The centripetal acceleration on the car is 22.0 m/s². Find the radius of the curve.

193. A subject in a large centrifuge has a radius of 8.9 m and a centripetal acceleration of 20g (g = 9.81 m/s²). What is the tangential speed of the subject?

194. A 1250 kg automobile with a tangential speed of 48.0 km/h follows a circular road that has a radius of 35.0 m. How large is the centripetal force?

195. A rock in a sling is 0.40 m from the axis of rotation and has a tangential speed of 6.0 m/s. What is the rock's mass if the centripetal force is 8.00×10^2 N?

196. A 7.55×10^{13} kg comet orbits the sun with a speed of 0.173 km/s. If the centripetal force on the comet is 505 N, how far is it from the sun?

197. A 2.05×10^8 kg asteroid has an orbit with a 7378 km radius. The centripetal force on the asteroid is 3.00×10^9 N. Find the asteroid's tangential speed.

198. Find the gravitational force between a 0.500 kg mass and a 2.50×10^{12} kg mountain that is 10.0 km away.

199. The gravitational force between Ganymede and Jupiter is 1.636×10^{22} N. Jupiter's mass is 1.90×10^{27} kg, and the distance between the two bodies is 1.071×10^6 km. What is Ganymede's mass?

200. At the sun's surface, the gravitational force on 1.00 kg is 274 N. The sun's mass is 1.99×10^{30} kg. If the sun is assumed spherical, what is the sun's radius?

201. At the surface of a red giant star, the gravitational force on 1.00 kg is only 2.19×10^{-3} N. If its mass equals 3.98×10^{31} kg, what is the star's radius?

202. Uranus has a mass of 8.6×10^{25} kg. The mean distance between the centers of the planet and its moon Miranda is 1.3×10^5 km. If the orbit is circular, what is Miranda's period in hours?

203. What is the tangential speed in problem 202?

204. The rod connected halfway along the 0.660 m radius of a wheel exerts a 2.27×10^5 N force. How large is the maximum torque?

205. A golfer exerts a torque of 0.46 N•m on a golf club. If the club exerts a force of 0.53 N on a stationary golf ball, what is the length of the club?

206. What is the orbital radius of the Martian moon Deimos if it orbits 6.42×10^{23} kg Mars in 30.3 h?

207. A 4.00×10^2 N•m torque is produced applying a force 1.60 m from the fulcrum and at an angle of 80.0° to the lever. How large is the force?

208. A customer 11 m from the center of a revolving restaurant has a speed of 1.92×10^{-2} m/s. How large a centripetal acceleration acts on the customer?

209. A toy train on a circular track has a tangential speed of 0.35 m/s and a centripetal acceleration of 0.29 m/s². What is the radius of the track?

210. A person against the inner wall of a hollow cylinder with a 150 m radius feels a centripetal acceleration of 9.81 m/s². Find the cylinder's tangential speed.

211. The tangential speed of 0.20 kg toy carts is 5.6 m/s when they are 0.25 m from a turning shaft. How large is the centripetal force on the carts?