

Chapter 7 Problems

E3200x Mechanics

Chapter 8

$$4. \quad \langle U \rangle = -\frac{k}{a}; \quad \langle T \rangle = \frac{k}{2a}$$

$$14. \quad F(r) = -\frac{l^2}{\mu} \left(\frac{6k}{r^4} + \frac{1}{r^3} \right)$$

- 8-2. Perform the integration of Equation 8.38 to obtain Equation 8.39.
- 8-4. Perform an explicit calculation of the time average (i.e., the average over one complete period) of the potential energy for a particle moving in an elliptical orbit in a central inverse-square-law force field. Express the result in terms of the force constant of the field and the semimajor axis of the ellipse. Perform a similar calculation for the kinetic energy. Compare the results and thereby verify the virial theorem for this case.
- 8-14. Find the force law for a central-force field that allows a particle to move in a spiral orbit given by $r = k\theta^2$, where k is a constant.