

HW #11
 due 28 Nov 2006

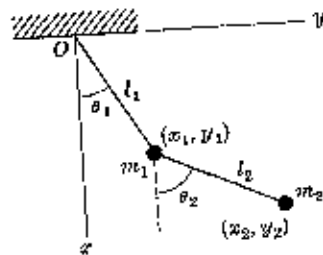


Fig. 11-3

11.28. A double pendulum [see Problem 11.1(c) and Fig. 11-3, page 285] vibrates in a vertical plane. (a) Write the Lagrangian of the system. (b) Obtain equations for the motion.

11.29. Write the equations of Problem 11.28 for the case $m_1 = m_2 = m$ and $l_1 = l_2 = l$.

11.30. Obtain the equations of Problem 11.29 for the case where the oscillations are assumed to be small.

11.35. A bead slides without friction on a frictionless wire in the shape of a cycloid [Fig. 11-10] with equations

$$x = a(\theta - \sin \theta), \quad y = a(1 + \cos \theta)$$

where $0 \leq \theta \leq 2\pi$. Find (a) the Lagrangian function, (b) the equation of motion.

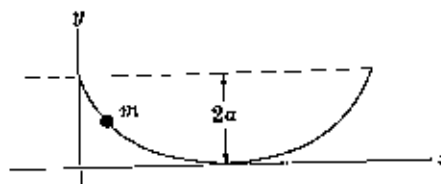


Fig. 11-10

11.36. (a) Show that the equation of motion obtained in part (b) of Problem 11.35 can be written

$$\frac{d^2 u}{dt^2} + \frac{g}{4a} u = 0 \quad \text{where } u = \cos(\theta/2)$$

and thus (b) show that the bead oscillates with period $2\pi\sqrt{4a/g}$.