9. As seen in Fig. 13-37, two spheres of mass m and a third sphere of mass M form an equilateral triangle, and a fourth sphere of mass m_4 is at the center of the triangle. The net gravitational force on that central sphere from the three other spheres is zero. (a) What is M in terms of m? (b) If we double the value of m_4, what then is the magnitude of the net gravitational force on the central sphere?

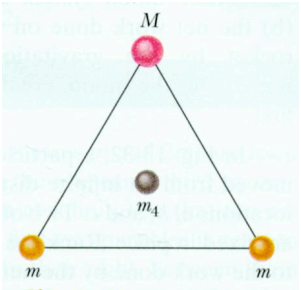

Fig. 13-37 Problem 9.

32. Zero, a hypothetical planet, has a mass of 5.0×10^{23} kg, a radius of 3.0×10^{6} m, and no atmosphere. A 10 kg space probe is to be launched vertically from its surface. (a) If the probe is launched with an initial energy of 5.0×10^{7} J, what will be its kinetic energy when it is 4.0×10^{6} m from the center of Zero? (b) If the probe is to achieve a maximum distance of 8.0×10^{6} m from the center of Zero, with what initial kinetic energy must it be launched from the surface of Zero?

42. A satellite is put in a circular orbit about Earth with a radius equal to one-half the radius of the Moon's orbit. What is its period of revolution in lunar months? (A lunar month is the period of revolution of the Moon.)

103. A certain triple-star system consists of two stars, each of mass m, revolving in the same circular orbit of radius r around a central star of mass M (Fig. 13-53). The two orbiting stars are always at opposite ends of a diameter of the orbit. Derive an expression for the period of revolution of the stars.

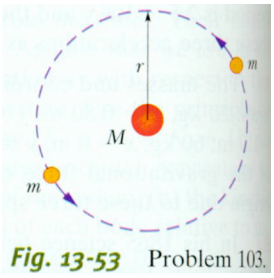

Fig. 13-53 Problem 103.