Phys101 – Sec # 40 Quiz # 10 (Chapter 13)

Name: Key **ID #** ______________

Four point masses are at the corners of a square whose side is 20 cm long (see figure 4). What is the magnitude of the net gravitational force on a point mass $m_5 = 2.5$ kg located at the center of the square?

$$F_{net} = G\frac{m_5 (4\text{ kg})}{(0.1414)^2} = \frac{6.67\times10^{-11}(2.5)(4)}{(0.1414)^2}$$

$$= 3.3 \times 10^{-8}\ \text{N}$$

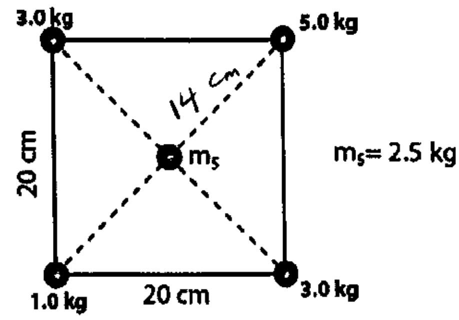
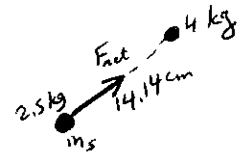


Figure 4



A planet has a mass of 5.0×10^{23} kg and a radius of 2.0×10^{6} m. A rocket is fired vertically from the surface of the planet with an initial speed of 4.0 km/s. What is the speed of the rocket when it is 1.0×10^{6} m from the surface of the planet?

$$\Delta K + \Delta U = 0$$

$$\frac{1}{2}\cancel{m}(v_f^2 - v_i^2) - G\frac{\cancel{m}M}{(R+h)} + G\frac{\cancel{m}M}{R} = 0$$

$$\cancel{\tfrac{1}{2}}v_f^2 - \cancel{\tfrac{1}{2}}v_i^2 = 2GM\left(\frac{1}{(R+h)} - \frac{1}{R}\right)$$

$$v_f = \sqrt{v_i^2 + 2GM\left(\frac{1}{R+h} - \frac{1}{R}\right)}$$

$$= \sqrt{(4\times10^{3})^2 + 2(6.67\times10^{-11})(5\times10^{23})\left(\frac{1}{3\times10^{6}} - \frac{1}{2\times10^{6}}\right)}$$

$$= 2210\ \frac{m}{s} = 2.2\ \frac{km}{s}.$$