Chapter 6:
Circular Motion and Gravitation

SUMMARY

Note we do **NOT** do this in PHYS111

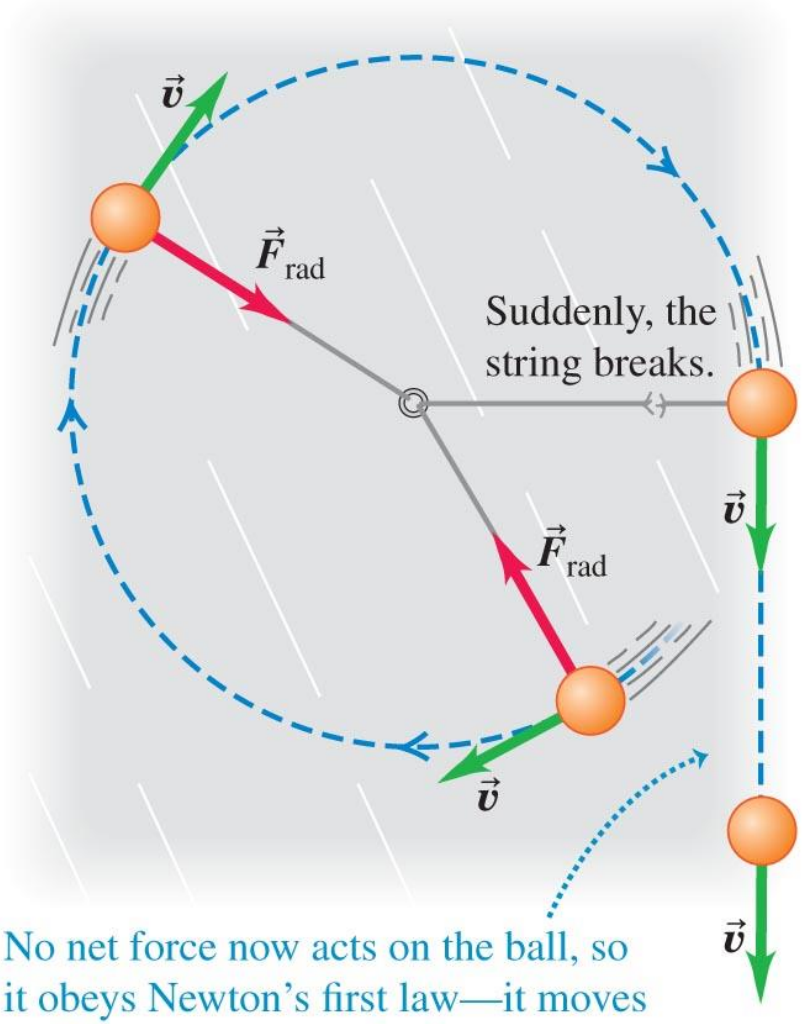
23 Aug 2021

Radial acceleration

$$a_{\text{rad}} = \frac{u^2}{R}$$

$$F_{\text{net}} = F_{\text{rad}} = m\frac{u^2}{R}$$

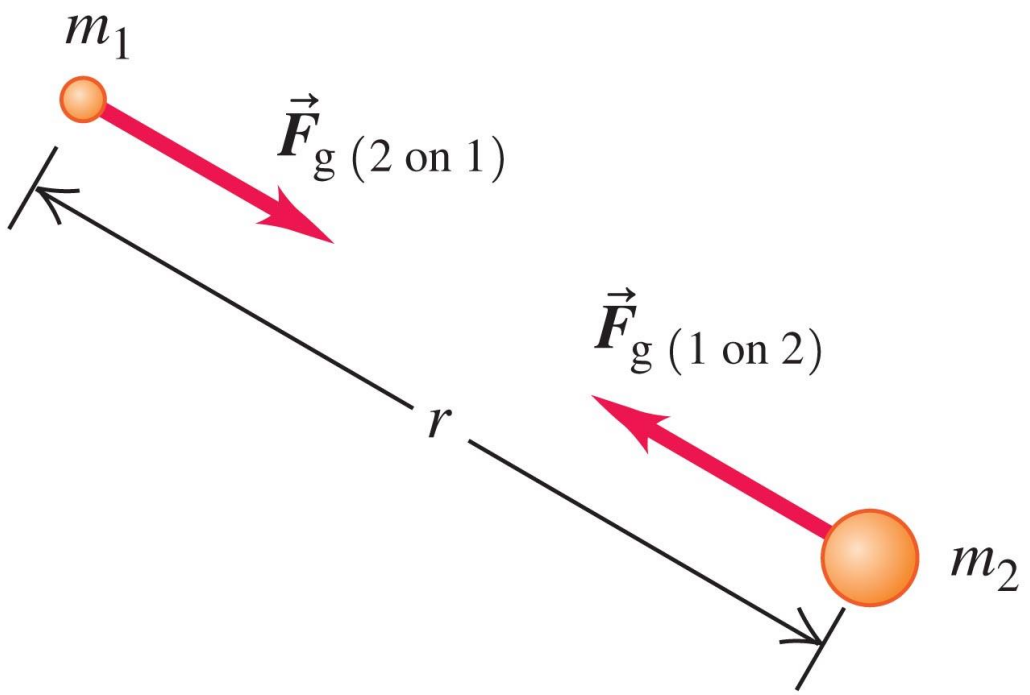
A ball whirls on a string attached to a rotating peg in the center of a frictionless table (viewed from above). Suddenly, the string breaks, releasing the radial force on the ball.



No net force now acts on the ball, so it obeys Newton's first law—it moves straight at constant velocity.

Newton's Law of Gravitation

$$F_g = G\frac{m_1 m_2}{r^2}$$



$$G = 6.674 \times 10^{-11}\ \mathrm{N \cdot m^2/kg^2}$$

$$F_{g\ (1\ on\ 2)} = F_{g\ (2\ on\ 1)}$$

Weight

- The weight of an object is the net gravitational force exerted on the object by all other objects in the universe
- Weight of an object near the surface of the earth is:

$$m_1 g = w = F_{\text{g, earth surface}} = G\frac{m_1 m_E}{R_E^2}$$

- With this we find that the acceleration due to gravity near the earth's surface is:

$$g = G\frac{m_E}{R_E^2} = 9.8 \ \text{m/s}^2 \ \text{at surface of Earth}$$