Gravitation

Book Chapter: 7

Book Pages: 201-211

Practice Problems: pp216-218; 32, 36, 40, 55

Terms/ Ideas:
Kepler's Laws
Gravitation
G
Universal Law of Gravitation
Gravitational Force
Inverse Square Law
Gravitational Potential Energy

Equations:

$$\frac{R^3}{T^2} = K$$

$$f = G\frac{m_1 m_2}{d^2}$$

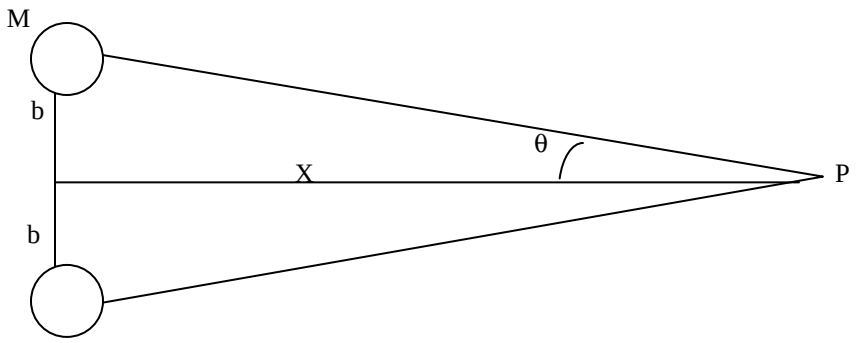
$$g = \frac{GMm}{R^2}$$

$$v = \sqrt{Rg}$$

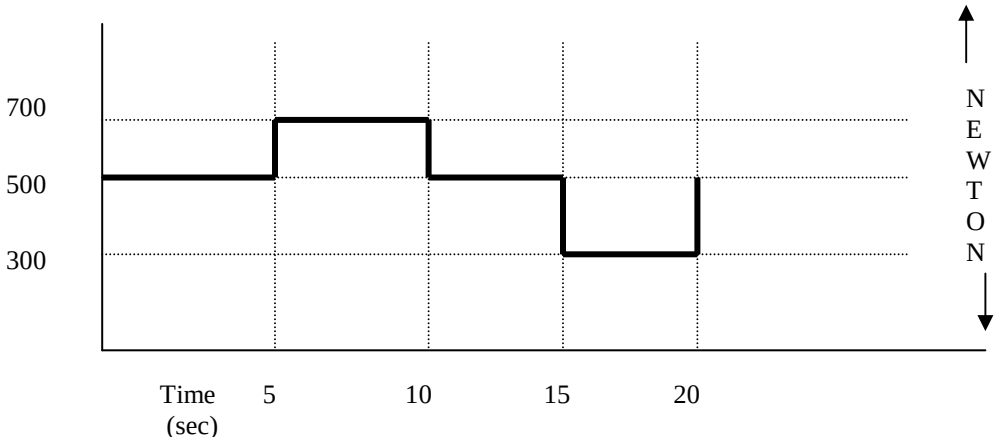
$$a_c = \frac{4\pi R}{T^2}$$

$$a = g = \frac{GM_e}{R_e^2}$$

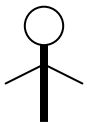
Free Response Question:
a) Find the magnitude of the gravitational field strength g at point P along the perpendicular bisector between 2 equal masses M and M, which are separated by a distance as shown below.



b) A student whose normal weight is 500. Newtons stands on a spring scale in an elevator and records the scale reading as a function of time. The data are shown in the graph below. At time t=0, the elevator is at displacement x=0 with velocity v=0. Assume that the positive directions for displacement, velocity and acceleration are upward.

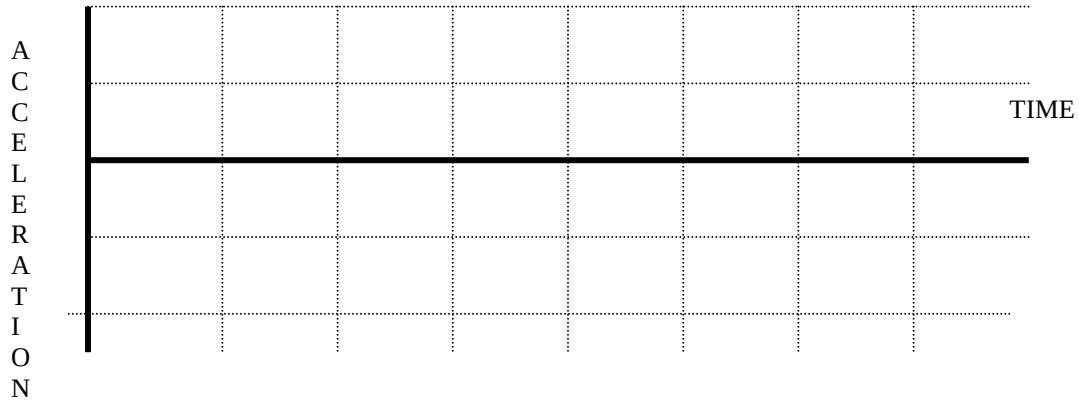


A) On the diagram below draw and label all of the forces on the student at t=8 seconds.



B) Calculate the acceleration a of the elevator for each 5 second interval.

C) Plot the acceleration as a function of time in the graph below.



D) Another person joins the first in the elevator. This individual weighs 980 N. The first and second person stand 1.50 meters apart. What is the gravitational attraction between the two people?

E) If the elevator is at sea level, what velocity would you need to give the elevator to put it into circular orbit around the earth?