From Ch. 8

• If the moon had 1/4-th the radius of earth and 1/81-th of the earth’s mass what would be the acceleration due to gravity on its surface? Answer: $g_m = 2 \text{ m/s}^2$.

• What would be the speed of a satellite of the earth, in a circular orbit of radius $10R_e$? Answer: 2.5 km/s.

• If an object is launched from the surface of earth at $v_0$, how high does it go? Answer: measuring from the center of the earth, $r_{\text{max}} = R_e/[((v_0^2)/(2gR_e)) - 1]$. To get $h$, the distance above the surface, subtract $R_e$ from $r_{\text{max}}$.

• An alien starship is in orbit above an alien planet. The radius of the orbit is $10^8$ m and the period is 10 hours. What is the mass of the planet? Answer: About $4.5 \times 10^{26}$ kg.

• An object is held at rest a distance $h$ above the earth’s surface, where $h$ can be any distance at all. When dropped, with what speed does it impact the surface? [Neglect the atmosphere, and the earth’s various motions.] Answer: 

$$v_f = \sqrt{2gR_e[1 - (R_e/(R_e + h))]}.$$  

• An object is in an elliptical orbit and at a given
instant it is halfway between its point of closest app-
roach and point of furthest approach. How far is
it from the body it is orbiting, if $b/a = 0.5$ for the
orbit. Answer: $r = a$. 