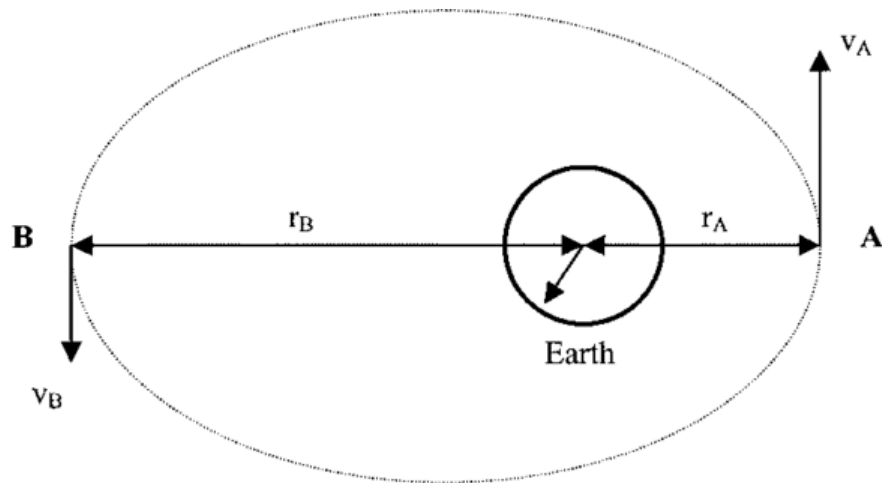




A spacecraft of mass 1000 kilograms is in an elliptical orbit above the earth, as shown above. At point A the spacecraft is a distance $r_A = 1.2 \times 10^7$ m from the center of the earth and its velocity, of magnitude $v_A = 7.1 \times 10^3$ m/sec is perpendicular to the line connecting the center of the Earth to the spacecraft. The mass and radius of the earth are $M_E = 6.0 \times 10^{24}$ kg and $r_E = 6.4 \times 10^6$ m, respectively. ($G = 6.67 \times 10^{-11}$ Nm²/kg²)

Determine each of the following for the spacecraft when it is at point A:

(a) The gravitational force on the space craft

(b) Determine the speed v_B of the spacecraft at point B.

$r_B = 3.6 \times 10^7$ m from the center of the earth.

$$r_B = 3.6 \times 10^7 \text{ m}$$

(c) Use Kepler's Laws to estimate the period of this orbit.

(d) Suppose that a different spacecraft is at point A, a distance r_A from the center of the earth. Determine the speed of the spacecraft if it is in a circular orbit around earth.