

Answer on Question #67937 – Physics / Other

Consider of the motion of the earth around the sun. Assume that the earth orbit is a perfect circle and the earth moves at constant speed around the sun. The earth orbits the sun at average distance of 1.0×10^{11} m.

a) what is the orbital speed of the earth around the sun? Answer in m/s.

B) what is the radial acceleration of the earth around the sun?

C) what direction is acceleration pointing?

Solution:

a) From the second Newton's law

$$ma = G \frac{mM_{\text{sun}}}{R^2}$$

$$\frac{v^2}{R} = G \frac{M_{\text{sun}}}{R^2}$$

Thus, the speed of the Earth around the Sun

$$v = \sqrt{G \frac{M_{\text{sun}}}{R}} = \sqrt{6.67 \times 10^{-11} \frac{1.99 \times 10^{30}}{1.0 \times 10^{11}}} = 36432.54 \text{ m/s.}$$

b) The radial acceleration of the Earth around the Sun

$$a = \frac{v^2}{R} = G \frac{M_{\text{sun}}}{R^2} = 6.67 \times 10^{-11} \frac{1.99 \times 10^{30}}{(1.0 \times 10^{11})^2} = 0.13 \text{ m/s}^2.$$

c) The acceleration of the Earth has direction to the center of Sun.

Answers: a) 36432.54 m/s, b) 0.13 m/s², c) to the center of Sun.

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