

Question #31973

an asteroid is 3 times as far from the sun as the earth. what is it's period
in earth years?

Solution

According to the third Kepler's law

"The square of the orbital period of a planet is directly proportional to the cube of the semi-major axis of its orbit."

$$\frac{P_{\text{asteroid}}^2}{a_{\text{asteroid}}^3} = \frac{P_{\text{earth}}^2}{a_{\text{earth}}^3}$$

$$P_{\text{asteroid}} = \sqrt{\frac{P_{\text{earth}}^2 * a_{\text{asteroid}}^3}{a_{\text{earth}}^3}} = P_{\text{earth}} \sqrt{\frac{a_{\text{asteroid}}^3}{a_{\text{earth}}^3}}$$

Such as

$$a_{\text{asteroid}} = 3a_{\text{earth}}$$

$$P_{\text{asteroid}} = P_{\text{earth}} \sqrt{3^3}$$

$$P_{\text{asteroid}} \approx 5.2 P_{\text{earth}} \approx 5.2 \text{ years}$$

Answer:

The period is 5.2 earth years. (5 years 73 days)