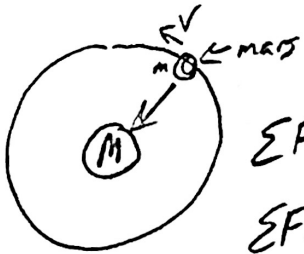


5.

Use the data at the back of this quiz to find the orbital period of Mars.

$$T = \text{time to orbit} = \frac{2\pi r}{v} \Rightarrow v = \frac{2\pi r}{T}$$



$$\Sigma F = \frac{mv^2}{r}$$

$$\Sigma F = \frac{GMm}{r^2}$$

$$\Rightarrow \frac{mv^2}{r} = \frac{GMm}{r^2}$$

$$v = \sqrt{\frac{GM}{r}}$$

$$\frac{2\pi r}{T} = \sqrt{\frac{GM}{r}}$$

$$T = \frac{2\pi r}{\sqrt{\frac{GM}{r}}}$$

$$\frac{2}{T^2} = \frac{4\pi^2 r^2}{(GM/r)} \Rightarrow T = \sqrt{\frac{4\pi^2 r^3}{GM}} = 2\pi \sqrt{\frac{r^3}{GM}}$$

$$T = \frac{4\pi^2 (2.278 \times 10^{11})^3}{\sqrt{6.67 \times 10^{-11} \frac{N \cdot m^2}{kg^2} (1.991 \times 10^{30})}}$$

$$= 5.93 \times 10^7 \text{ s}$$

$$= 1.88 \text{ Earth years}$$