

SemiMajor Axis

$$a = (8.1 \times 10^6 + 76500) / 2 = 4.09 \times 10^6 \text{ km} = 4.09 \times 10^9 \text{ m}$$

Eccentricity

$$e = \frac{8.1 \times 10^6 - 76500}{8.1 \times 10^6 + 76500} = 0.9815$$

Velocities from vis-viva equation

Perijove

$$v_p = \sqrt{GM \left(\frac{2}{r_p} - \frac{1}{a} \right)} = \sqrt{1.267 \times 10^{17} \frac{\text{m}^3}{\text{s}^2} \left(\frac{2}{76.5 \times 10^6 \text{ m}} - \frac{1}{4.09 \times 10^9 \text{ m}} \right)}$$
$$= 57.7 \text{ km/s} = 129\,000 \text{ miles/hour}$$

Threshold distance

$$v_t = \sqrt{GM \left(\frac{2}{r_t} - \frac{1}{a} \right)} = \sqrt{1.267 \times 10^{17} \frac{\text{m}^3}{\text{s}^2} \left(\frac{2}{225 \times 10^6 \text{ m}} - \frac{1}{4.09 \times 10^9 \text{ m}} \right)}$$
$$= 33.1 \text{ km/s}$$

Apojove

$$v_a = \sqrt{GM \left(\frac{2}{r_a} - \frac{1}{a} \right)} = \sqrt{1.267 \times 10^{17} \frac{\text{m}^3}{\text{s}^2} \left(\frac{2}{8.1 \times 10^9 \text{ m}} - \frac{1}{4.09 \times 10^9 \text{ m}} \right)}$$
$$= 0.54 \text{ km/s}$$

Approximating Juno's 53-day orbit

Linear segments

$$t_{AB} = t_{CD} = \frac{(225 \times 10^3 \text{ km} - 76.5 \times 10^3 \text{ km})}{33.2 \text{ km/s}} = 4473 \text{ s}$$

Semicircle

$$t_{BC} = \frac{\pi \times 76.5 \times 10^3 \text{ km}}{57.7 \text{ km/s}} = 4165 \text{ s}$$

Total

$$t_{AD} = t_{AB} + t_{BC} + t_{CD} = 13\,111 \text{ s} = 3.6 \text{ hours}$$

Orbit fraction

$$\frac{t_{AD}}{P_{\text{Juno}}} = \left(\frac{3.6 \text{ h}}{1272 \text{ h}} \right) = 0.28\%$$