

10.6: Elements of a Hyperbolic Orbit

In place of the semi major axis, we have the semi transverse axis, symbol a . This amounts to just a name change, although some authors treat a for a hyperbola as a negative number, because some of the formulas, for example for the speed in an orbit, $V^2 = GM \left(\frac{2}{r} - \frac{1}{a} \right)$, are then identical for an ellipse and for a hyperbola.

Although there is no fundamental reason why the solar system should not sometime receive a cometary visitor from interstellar space, as yet we know of no comet with an original hyperbolic orbit around the Sun. Some comets, initially in elliptic orbits, are perturbed into hyperbolic orbits by a close passage past Jupiter, and are then lost from the solar system. Such orbits are necessarily highly perturbed and one cannot in general compute a reliable ephemeris by treating it as a simple two-body problem; the instantaneous osculating elements will not predict a reliable ephemeris far in advance.

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