Short version

Smith

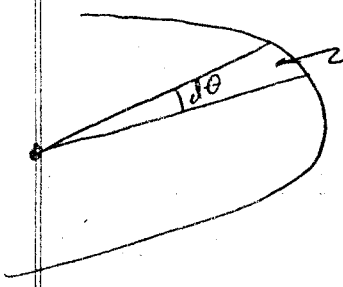
OK
KLN
OK RC

One of Kepler's laws states that the area swept out per unit time by the radius vector from the sun to a planet is constant. Prove this statement

For planetary motion have gravitational Force

$$F = -G\frac{m_1 m_2}{r^2}\hat{r}$$; a central force

So $\vec{N} = 0 = \frac{d\vec{h}}{dt} \Rightarrow \vec{h} = \text{constant} = m r^2 \dot{\theta}$



area $dS = \frac{1}{2} r(r\,d\theta)$

so

$$\frac{dS}{dt} = \frac{1}{2} r^2 \dot{\theta} = \frac{h}{2m} = \text{constant}$$

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