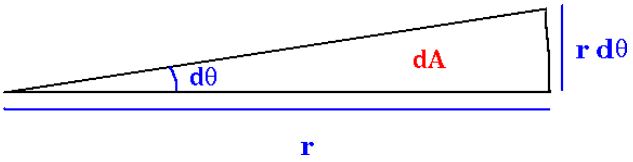
On which fundamental law of physics is Kepler's second law is based?

Answer

Kepler's second law is a consequence of the principle of conservation of angular momentum.

Consider a small wedge of the orbit traced out in time dt:



So the area of the wedge is

$$dA = \frac{1}{2}(r)(rd\theta).$$

And the rate at which area is swept out on the orbit is

$$\frac{dA}{dt} = \frac{1}{2}(r)\left(r\frac{d\theta}{dt}\right) = \frac{1}{2}rv_\theta.$$

Now, remember the definition of angular momentum:

$$\vec{L} = m(\vec{r} \times \vec{v}), L = mrv_\theta.$$

Inserting this previous equation, we get

$$\frac{dA}{dt} = \frac{1}{2}\frac{L}{m}.$$

"Equal areas in equal times" means the rate at which area is swept out on the orbit $\frac{dA}{dt}$ is constant.

It means one-half its angular momentum divided by its mass is constant. So Angular momentum is conserved.