So, $\frac{1}{r}\frac{d}{dt}\left(r^2\frac{d\phi}{dt}\right) = 0$

So, $r^2\frac{d\phi}{dt} = K =$ Constant

This is the Kepler's law of area.

Hence, the angular momentum p_ϕ is a constant as given by

$$p_\phi = mr^2\frac{d\phi}{dt} \quad (m = \text{mass of the electron})$$

Thus from Sommerfeld's quantum restriction

$$kh = \oint p_\phi \, d\phi = p_\phi \oint d\phi$$

$$= mr^2\frac{d\phi}{dt} \times 2\pi$$

$$= p_\phi \times 2\pi$$

$$p_\phi = k\left(\frac{h}{2\pi}\right)$$

This is in good agreement with postulate of Bohr according to which the angular momentum of an electron in any stationary orbit is an integral multiple of $h/2\pi$

Proof for $b/a = k/n$

Momentum along the radius $= p_r = m \cdot dr/dt$

$\therefore \quad p_r \, dr = m \cdot \frac{dr}{dt} dr$

$$= m\left(\frac{dr}{d\phi}\frac{d\phi}{dt}\right)\frac{dr}{d\phi} \cdot d\phi$$

$p_\phi = mr^2\frac{d\phi}{dt}$

$$= m\left(\frac{dr}{d\phi}\right)^2 \cdot \frac{d\phi}{dt} \cdot d\phi$$

$$= \left(\frac{1}{r}\frac{dr}{d\phi}\right)^2 \cdot p_\phi \cdot d\phi \longrightarrow (\mathrm{I})$$