Government Degree College, Rangasaipet,

Warangal District

Department of Physical Sciences

Details of Project work as follows

S.No.	Details of Project work	Names of Students	Remarks
1.	Application of schrodinger wave equation to different potentials.	Fathima, Ruheena	-

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$$P = \frac{GM}{r^2}$$

Let us assume that $GM = \mu$

$$P = \frac{\mu}{r^2} \rightarrow (1)$$

equation of motion under control force is

$$\left(\frac{d^2u}{d\theta^2} + u\right) = \frac{P}{h^2u^2} \longrightarrow (2) \quad \left(\because u = \frac{1}{r},\ h = r^2\frac{d\theta}{dt}\right)$$

sub eq(1) in (2)

$$\left(\frac{d^2u}{d\theta^2} + u\right) = \left(\frac{\mu}{r^2}\right)\left(\frac{1}{h^2r^2}\right)$$

$$\frac{d^2u}{d\theta^2} + u = (\mu)(\cancel{r^2})\frac{1}{h^2\cancel{r^2}}$$

$$\frac{d^2u}{d\theta^2} + u = \frac{\mu}{h^2}$$

$$\frac{d^2u}{d\theta^2} + u - \frac{\mu}{h^2} = 0$$

$$\frac{d^2}{d\theta^2}\left(u - \frac{\mu}{h^2}\right) + \left(u - \frac{\mu}{h^2}\right) = 0$$

assume that $u - \frac{\mu}{h^2} = x \longrightarrow (3)$

$$\frac{d^2x}{d\theta^2} + x = 0$$

solution to the above equation

$$x = A\cos(\theta - \theta_1) \longrightarrow (4)$$

Where A, θ_0 are constant of motions

sub eq (3) in (4)

$$u = \frac{\mu}{h^2} - A\cos(\theta - \theta_0)$$

$$u = \frac{\mu}{h^2} + A\cos(\theta - \theta_0) \rightarrow (*)$$

$$u = \frac{\mu}{h^2}\left[1 + \frac{h^2}{\mu^2} A\cos(\theta - \theta_0)\right]$$

$$u = \frac{\left[1 + \frac{Ah^2}{\mu}\cos(\theta - \theta_0)\right]}{\left(\frac{h^2}{\mu}\right)}$$

$$\frac{1}{r} = \frac{\left[1 + \frac{Ah^2}{\mu}\cos(\theta - \theta_0)\right]}{\left(h^2/\mu\right)} \rightarrow (5)$$

We know that equation of conic section is in polar form

$$\frac{1}{r} = \frac{1 + \epsilon\cos\theta}{l} \rightarrow (6)$$

where ϵ = eccentricity

l = semi latus rectum

comparing eq (5) & (6)

$$\epsilon = \frac{Ah^2}{\mu} \qquad l = \frac{h^2}{\mu^2}$$

If $\epsilon < 1$ the path is elliptical

If $\epsilon > 1$ the path is hyperbola

If $\epsilon = 1$ the path is parabola.

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