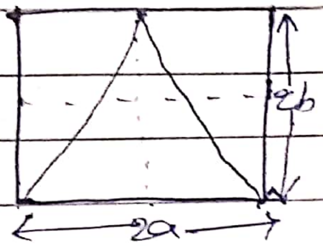
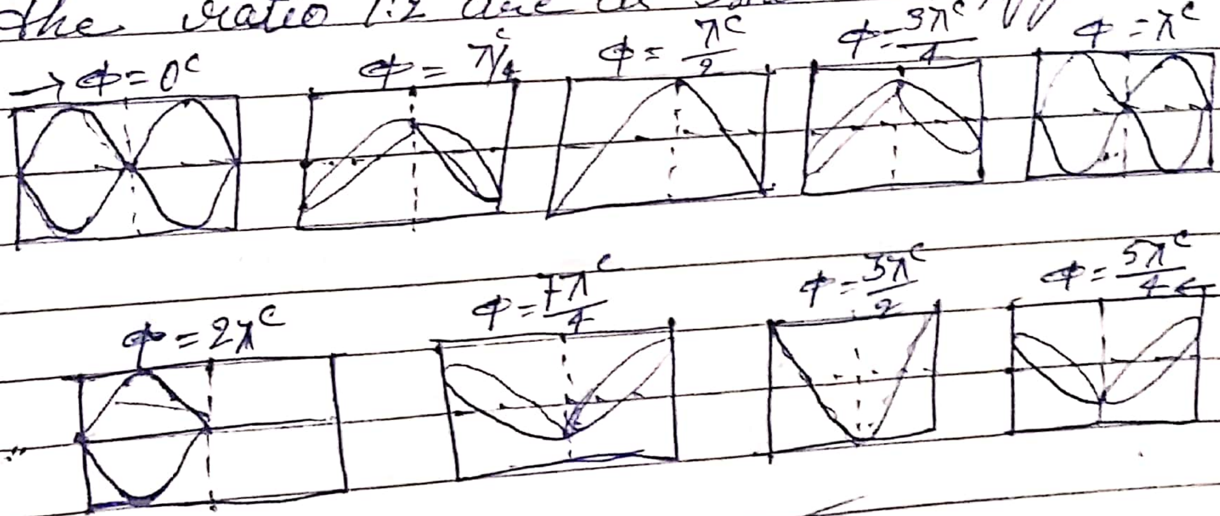
$$\frac{y}{b} = 1 - \frac{2x^2}{a^2}$$



$$\frac{y}{b} = \frac{a^2 - 2x^2}{a^2}$$

$$y = -\frac{b}{a^2}(2x^2 - a^2) \quad \text{—— (5) eq}$$

This eq. resultants a parabola is in case II and The Lissajous figures obtained under the action of two S.H.M.s having different amplitudes, phase and frequencies in the ratio 1:2 are as shown in fig.



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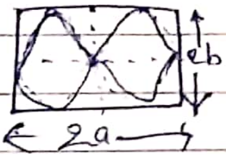
Sem 2-Unit-2

Some important cases of two S.H.M. ~~Right~~ right angles with frequency ratio (1:2) →

Case I – When $\phi = 0^c$ substituting in eq 3, we get:

$$\left(\frac{y}{b} - \sin 0^c\right)^2 + \frac{4x^2 y}{a^2 b}\sin 0^c - \frac{4x^2}{a^2} + \frac{4x^2}{a^4} = 0$$

$$\frac{y^2}{b^2} - \frac{4x^2}{a^2} + \frac{4x^2}{a^4} = 0$$



The resultant motion is in fig.

$$\frac{y^2}{b^2} + \frac{4x^2}{a^2}\left(\frac{x^2}{a^2} - 1\right) = 0 \quad (4)$$

Case – II ~~When~~

When $\theta = \left(\frac{\pi}{2}\right)^c$ substituting in ~~equation~~ equation

$$\left(\frac{y}{b} - \sin\phi\right)^2 + \frac{4x^2 y}{a^2 b}\sin\phi - \frac{4x^2}{a^2} + \frac{4x^4}{a^4} = 0$$

$$\left(\frac{y}{b} - \sin\frac{\pi}{2}\right)^2 + \frac{4x^2 y}{a^2 b}\sin\frac{\pi}{2} - \frac{4x^2}{a^2} + \frac{4x^4}{a^4} = 0$$

$$\left(\frac{y}{b} - 1\right)^2 + \frac{4x^2 y}{a^2 b} - \frac{4x^2}{a^2} + \frac{4x^2}{a^4} = 0$$

$$\left(\frac{y}{b} - 1\right)^2 + \frac{4x^2}{a^2}\left(\frac{y}{b} - 1\right) + \frac{4x^4}{a^4} = 0$$

$$\left[\left(\frac{y}{b} - 1\right) + \frac{2x^2}{a^2}\right]^2 = 0$$

$$\left(\frac{y}{b} - 1\right) + \frac{2x^2}{a^2} = 0$$