40.The locus of the point of intersection of lines $\sqrt{3}x - y - 4\sqrt{3}k = 0$ and $\sqrt{3}kx + ky - 4\sqrt{3} = 0$ for different value of k is a hyperbola whose eccentricity is 2.

Ans:

Given The locus of the point of intersection of lines $\sqrt{3}x - y - 4\sqrt{3}k = 0$ and $\sqrt{3}kx + ky - 4\sqrt{3} = 0$ for different value of k is a hyperbola whose eccentricity is 2.

From the line $\sqrt{3}x - y - 4\sqrt{3}k = 0, k = \dfrac{\sqrt{3}x - y}{4\sqrt{3}}$.

And from the line $\sqrt{3}kx + ky - 4\sqrt{3} = 0, k = \dfrac{4\sqrt{3}}{\sqrt{3}x + y}$.

Equate the values of k.

$$\Rightarrow \frac{\sqrt{3}x - y}{4\sqrt{3}} = \frac{4\sqrt{3}}{\sqrt{3}x + y}$$

$$\Rightarrow 3x^2 - y^2 = 48$$

$\Rightarrow \dfrac{x^2}{16} - \dfrac{y^2}{48} = 1$ which is an equation of a hyperbola.

$\Rightarrow a^2 = 16$ and $b^2 = 48$

$$\Rightarrow e^2 = 1 + \frac{48}{16}$$

$$\Rightarrow e^2 = 1 + 3$$

$$\Rightarrow e^2 = 4$$

$\Rightarrow e = 2$

Hence, the given statement is true.