

Answer on Question #78892 – Math – Analytic Geometry

Question

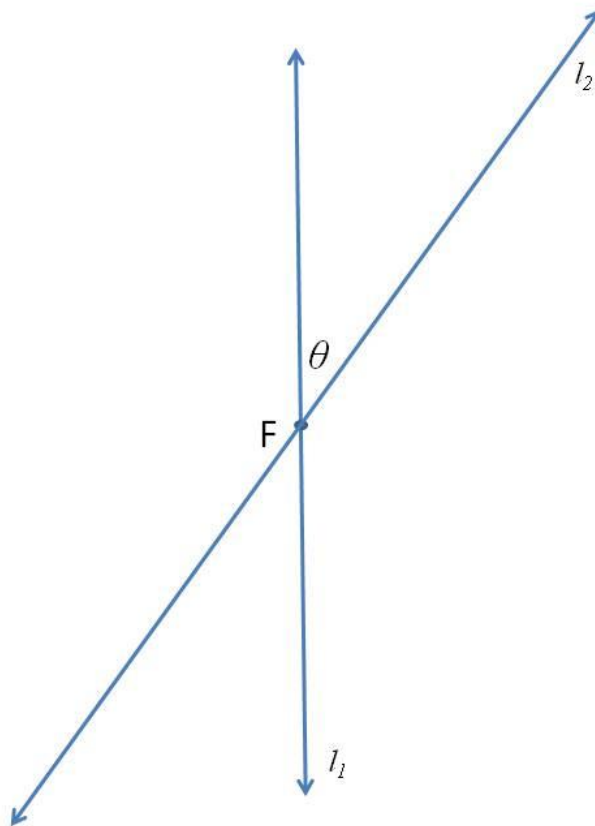
Can any conic have its focus lying on the corresponding directrix? Give reasons for your answer.

Solution

You can define conic section as locus of a point which moves so that the ratio of its distance from a given point called focus and a given line called directrix is always constant.

In case of ellipse, this ratio < 1 , in case of hyperbola, this ratio > 1 and in case of parabola, this ratio = 1.

What happens when focus is on the directrix itself? Consider the following diagram, where F is focus and directrix is line l_1 so that F lies on it. Consider another line l_2 passing through F, so that it forms an angle of θ with l_1 .



Now consider any other point on l_2 . Observe that the ratio of the distance of the point from focus F and directrix l_1 will always be $\frac{1}{\sin \theta}$. In fact, there could be two lines as distance is scalar and independent of sign and two lines with angles θ as well as $(180^\circ - \theta)$ will both have the same ratio.

Hence such a conic section will be a pair of lines.

Answer: Yes, such a conic section will be a pair of lines.

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