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ALGEBRAIC CURVE OF THE FOURTH DEGREE

Plane algebraic curve of the fourth degree is a line, which can be defined by algebraic equation of the fourth degree relative to Cartesian rectangular coordinate system.

Quatric plane curves include: lemniscate of Bernoulli, Cassini oval, conchoid of Nicomedes, limaçon of Pascal, rose curve, cardioid and many others.

Curves of the fourth degree are widely spread, they are used in manufacturing and construction. They have some quite interesting properties. Though we don't notice these curves in our everyday life, it is hard to imagine our life without them.

Let's consider the usage of quatric plane curves in everyday life, machinery, physics and other areas.

In machinery, among other factors, the lemniscate is used as a transition curve on a short radius curve which is applied to railroad tracks in mountainous areas and tramways.

An example of lemniscate usage in physics may be seen in equipotential lines of force, created by two parallel currents which flow through infinitely long conductors in area which is perpendicular to them.

Accoding to Bonat, lemniscate is a curve possessing the same properties as point mass that comes out of a state of rest under the influence of gravity and runs the arc of this curve at the same time as it runs the corresponding bisecant. The centerpoint of the lemniscate thus coincides with the starting point of the point mass that moves and its axis makes a 45° angle with its vertical line.

Cardioid has a different application in machinery. Eccentrics are shaped like cardioids. Sometimes it is used in gears designing. Draftsmen are quite familiar with cardioid, it occurs as a result of reciprocating action of engine pistons.

Cassini's ovals were discovered when people were trying to specify Earth's orbit. Jean-Dominique Cassini supposed that Earth's orbit is shaped as oval, not ellipsis, as it was proposed by Johannes Kepler.

Conchoid of Nicomedes is widely used in maths. This line was used for doubling the cube and finding the trisection of a cube. It is used for joining tangent and normal lines to curves and also for geometrical solution of the third degree equations.

Limaçon of Pascal is widely used in mechanics. It is used as a line for tracing out the outline of the eccentric, if it is necessary that the axis which roams through the profile, performs harmonious oscillations.

One of the components of mechanism for lifting and lowering the semaphore is traced round the limaçon of Pascal. Eccentric, that is traced round the limaçon, is quite efficient, as the speed of lifting or lowering the lever though being minimal at the beginning of movement reaches its maximum in the middle of the semaphore movement. It grants jerkless movement of the lever of semaphore with insignificant starting and ending joggles and also it lightens work against momentum and friction and especially it can be noticed at the initial activity of the drive.

The rose curve was used while studying the shape of leaves and flower petals.

As you see, curves of the fourth degree are widely spread and though we don't notice these curves in our everyday life, it is hard to imagine our life without them.

References

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