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Lekalovian curves

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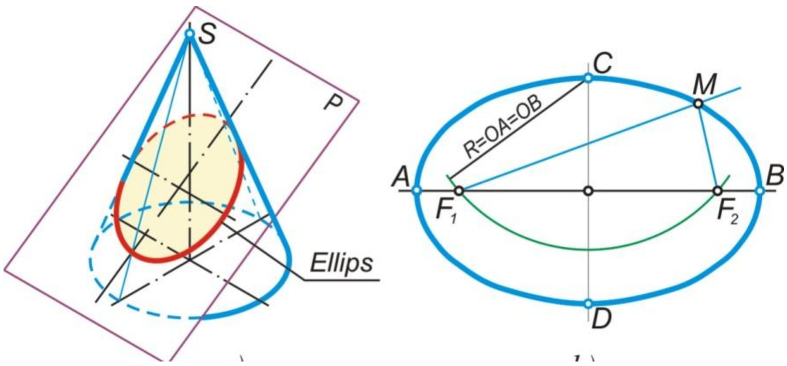
Annotation: Unlike the curves that consist of the connections of circular arcs and are made with the help of a circle, in Lecalo curves, points lying on the curve are first made, and then they are connected with the help of a lecalo.

Lecalovian curves include curves called conic sections, that is, formed by the intersection of a right circular cone with a plane - ellipses, parabolas, hyperbolas, as well as involutes and sinusoids.



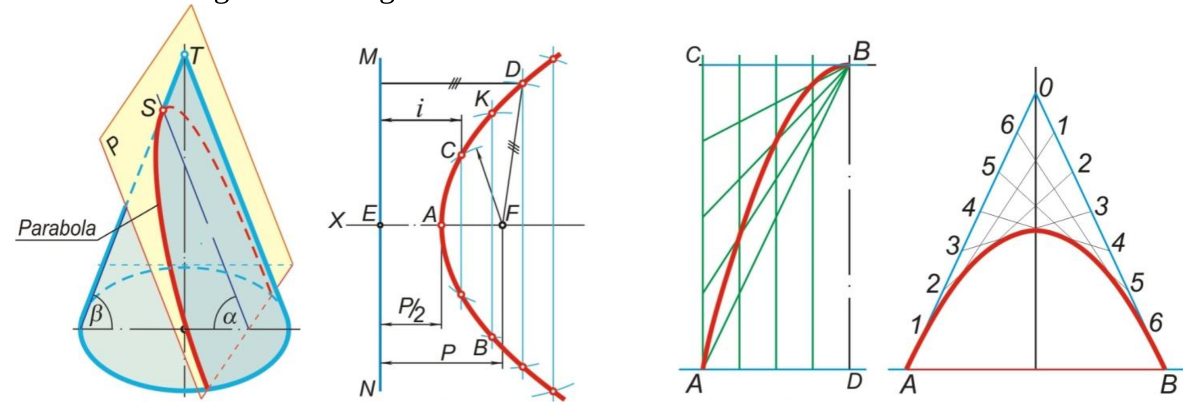
Ellipse. If we cut a circular cone so that all sides of the cone intersect with an inclined plane P, an ellipse is formed in the cutting plane.

An ellipse is a flat closed curve such that the sum of the distances from each of its points M,... to the given points F1 and F2 is a constant quantity, and it is the largest of the ellipse let MF1+MF2=AB equal to the axis. Ellipse axes - major axis AB, minor axis CD are mutually perpendicular and bisect each other. These axes divide the ellipse curve into four equal symmetrical parts. If a circular arc with a radius R = OA = OB equal to half of the major axis of the ellipse is passed through the minor axis CD as a center, then this arc intersects the major axis at the points F1 and F2, which are called foci.

Shows the method of making an ellipse according to its axes. On the given axes AB and CD, taking these sections as diameters, two concentric circles are drawn from the point O, that is, from the center. A large circle is divided into arbitrary segments and the resulting points are connected with the center O by means of a straight line. Crossing vertical and horizontal lines are drawn from the points 1, 1', 2, 2', 3, 3', 4, 4' of these lines intersected by auxiliary circles. The intersection points of these lines are E, F, M, K, points belonging to the ellipse. We connect the found points with a smooth curve using a ruler to form an ellipse.

A parabola is a straight curve such that each point of it lies at an equal distance from the given straight line MN perpendicular to the axis of the parabola - the guide and the focus F. The point A of the parabola is located between the focus F and the guide MN.

To make a parabola according to the given guide and focus, the axis x of the parabola is made perpendicular to the guide MN through the focus F, the section EF is divided into two equal parts, and the tip A of the parabola is formed. Straight lines are drawn perpendicular to the axis of the parabola at an arbitrary distance from the end. At a radius equal to the distance L from the guide to the corresponding line from the point F, for example, the radius SV, lines are marked on this line and points S and V are found. In the same way, several pairs of symmetry points are made, and a smooth curve is drawn through them using a ruler.



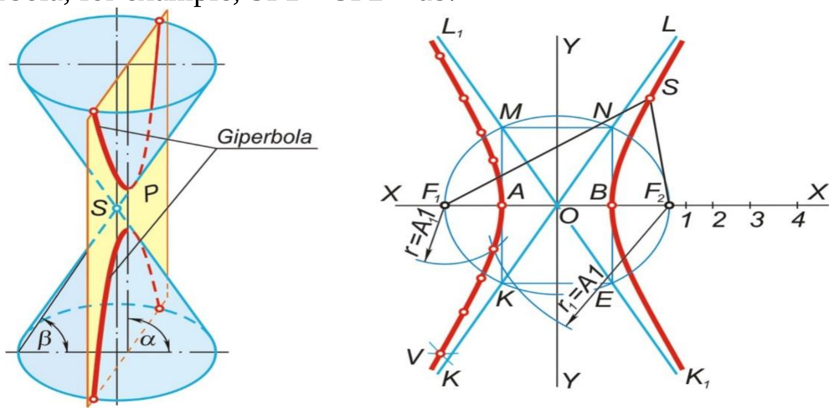
Shows two more ways to make a parabola. The first method is to make a parabola along one point A, the tip B and the axis BD, and the second method is to make it according to two given points A and B and AO and OB passing through these points.

A parabola is drawn through point A, point B and axis BD given. Horizontal and vertical straight lines intersecting at point C are passed through these points. These segments AC and BC are divided into the same number of segments. Vertical lines are drawn through the points formed on the horizontal section, and the dividing points of the vertical section are connected with the point B - the tip of the parabola. A series of points of a parabola is formed from the intersection of straight lines with the same number, and a parabola is formed by connecting these points with a smooth curve.

Figure 4, b shows another way of making a parabolic curve intersecting at points A and B on two straight lines AO and OB. Sections AO and OB are divided into the same equal parts (for example, eight parts). The resulting dividing points are numbered and the points of the same name are connected to each other by means of a straight line 1-1, 2-2, 3-3, etc., as shown in the figure. These straight lines are an attempt at a parabolic curve. Then a smooth trying curve - a parabola is drawn from the inside to the contour formed by straight lines.

Hyperbole. If the right and inverted cones are cut by their two constituents or, in particular, by a plane parallel to the axis, two symmetry curves - a hyperbola - are formed in the plane of the section.

A hyperbola is a straight curve such that the distance difference between each of its points and the given points F1 and F2, called the focus, is constant and is equal to the distance a and b between the ends of the hyperbola, for example, SF1 – SF2 = ab.



A hyperbola consists of two nets of symmetry and has two axes of symmetry - the real AB and the abstract CD. Two straight lines KL and K1 L1 passing through the center O of the hyperbola and extending to the branches of the hyperbola at infinity are called asymptotes.

A hyperbola can be constructed by given vertices a and b and foci F1 and F2. To make the tip of the hyperbola, a circle is drawn taking the distance between the foci (section F1F2) as a diameter and a rectangle is made inside it. On the real axis AB, arbitrary points 1, 2, 3, 4... are marked to the right of the focus F2. From the foci F1 and F2, circular arcs with radius A11 and then with radius A1 are drawn, and their points of intersection on both sides of the real axis of the hyperbola are determined. Next, the points of intersection of arcs with radius A22 and B2 (point C) are determined, and so on. The points obtained from the intersection of the arcs are the points belonging to the right network of the hyperbola. The points of the left branch of the hyperbola are symmetric about the abstract axis CD.

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