



THE IMPLEMENTATION OF ICT ON VARIOUS CURVES THROUGH WINPLOT

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ABSTRACT:

This paper aims to take a step further into the development and innovation of teaching, using contemporary instruments, which develops the necessary skills of the student community. To introduce the Win plot software in making teaching mathematical problems into an easier one so as to cheer up the students to develop their application oriented skills. This paper deals with the hope that the mathematics classroom will soon be converted into modern classroom where software oriented learning will take place in the near future.

KEYWORDS:

Higher education Mathematics, ICT, Mathematics pedagogy. Win plot software

1. Introduction:

ICT is one of the factors to shaping and changing the world rapidly. ICT has also brought a paradigm shift in education. It touches every aspect of Education. ICT has brought a new networks of teachers and learners connecting them throughout the globe. ICT is a means of accessing, processing, sharing, editing, selecting, presenting, communicating through the information in a variety of media. It involves sharing, finding, restricting the information and its diverse form.

A.INSTALLING WINPLOT

The download for WinPlot is a compressed File. Download a trial for winZip at <http://www.winzip.com/> to extract the files.

1. Go to the following website:
<http://math.exeter.edu/rparris/winplot.ht>

ml

2. Click on the link: Winplot for Windows 95/98/ME/2K/XP (558K)
3. When prompted, click save to save the file to the desktop.
4. Double click the icon wp32z.exe on the desktop.
5. WinZip will prompt to extract the files to C:\peanut. Click "Unzip".
6. Win Plot is now installed in C:\peanut directory.



B.BASICS OF WINPLOT

The first time Win Plot is used, the screen will look like this. From the Window menu, select 2-dim.



**VARIOUS CURVES THROUGH WINPLOT
II. VERSIERA**

A. Definition

The versiera curve is defined as follows: On the line segment $OA=2a$ as diameter, construct a circle C and let the half chord BC be continued to point M defined by the proportion

$$BM: BC = OA: OB.$$

When the point C transverse to a circle OC_1C_2 , point M describes a curve called versiera. It was also known as the witch of Agnesi.

B. Equation

The equation in Cartesian coordinates with origin at O , the tangent line X^1X to the generating circle at point O is

$$y = \frac{a^3}{a^2+x^2}$$

where $OA = a$, a is the diameter of the generating circle.

The equation parametrical representation is

$$x = at, \quad y = \frac{a}{1+t^2}$$

The area S of the infinite strip between the versiera and its asymptote is equal to four times the area of the generating circle.

$$S = 4\pi a^2$$

The volume V of the solid of revolution of the versiera about the asymptote is equal to the doubled volume V_1 of the solid of revolution of the generating circle about the same axis:

$$V = \frac{\pi^2 a^3}{2}, \quad V_1 = \frac{\pi^2 a^3}{4}$$

The solid of revolution of the versiera about the axis of symmetry has infinite volumes.

The centre of curvature K of the versiera at the vertex A coincides with the centre of the

generating circle so that the radius of curvature $R_A = AK = \frac{a}{2}$.

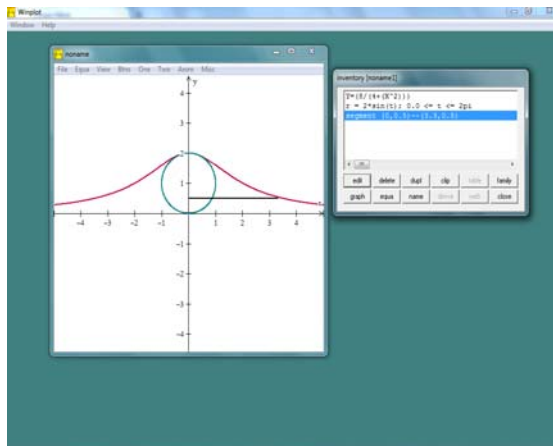
C. Stereometric Construction

Let L be the point of intersection of the straight line OC and the straight line UV tangent to the given circle at a point A (vertex of the versiera). Draw straight line $LM \parallel AO$ and $CB \parallel AL$. The point M of intersection of LM and CB lies on the Versiera.

D. History

The curve given by the equation $y = \frac{a^3}{a^2+x^2}$ is first encountered in Fermat's works. In the thirties of the 17th century he found the area bounded by an arc of this curve, by two ordinates and the axis of abscissas (at that time the problem was of considerable difficulty since methods of integration were just being developed). A construction of a versiera and its properties were given in 1718 by the Italian scholar G. Grandi, who gave it the name Versiera. In Italian this word means witch and Grandi generated the term sinus versus (versed sine): in Grand's day, the segment BC was called the sine of the arc OC , and the segment BA was called the versed sine. The curious name witch of Agnesi which is still encountered in mathematical works apparently has no historical identification.

E. Construction of Versiera Curve Using Winplot



III. CONCHOID OF NICOMEDES

A. Definition

The Conchoid of Nicomedes curve is defined as follows: Let O is the point (pole) and UV is the straight line (base line). From the pole O draw an arbitrary straight line ON intersecting the base

line UV at N. On ON lay off, on either side of the N, the line segment $NM_1=NM_2= l$. The locus of the point M_1, M_2 is called Conchoids of Nicomedia.

B.Equation

The equation of castorian coordinates with origin at O, the x-axis directed along the ray OB, and point B as the projection of the pole on the base line is

$$(x - a)^2(x^2 + y^2) = l^2y^2$$

Where $OB = a$, a is the distance from the pole to the base line.

The equation in polar coordinates with pole O and polar axis OX is

$$r = \frac{a}{\cos t} + l$$

where t varies from a value t_0 to $t_0+2\pi$, and the point $M (r, t)$ describes both branches of the conchoid. When t passes through the value $\frac{\pi}{2}$, the point M makes a jump from the outer branch to the inner branch. The transition is similar for $t = \frac{3\pi}{2}$ from the inner branch to the outer branch.

The parametric equations are

$$x = a + l \cos t, \quad y = a \tan t + l \sin t$$

Radii of curvature at the point

A, C, O:

$$R_A = \frac{(l+a)^2}{l}, \quad R_C = \frac{(l-a)^2}{l},$$

$$R_O = \frac{l\sqrt{(l^2-a^2)}}{2a}$$

Thus for $l = 2a$,

$$R_A = 4.5a, \quad R_C = 0.5a,$$

$$R_O = a\sqrt{3}$$

The area between the asymptote and one of the branches of the conchoids (outer or inner) is infinite. The area S of the loop is

$$S = a\sqrt{(l^2 - a^2)} - 2al \ln \frac{l+\sqrt{(l^2-a^2)}}{a} + l^2 \arccos \frac{a}{l}$$

Thus for $l=2a$,

$$S = a^2[\sqrt{3} - 4 \ln (2+\sqrt{3}) + \frac{4}{3}\pi] = 0.65 a^2$$

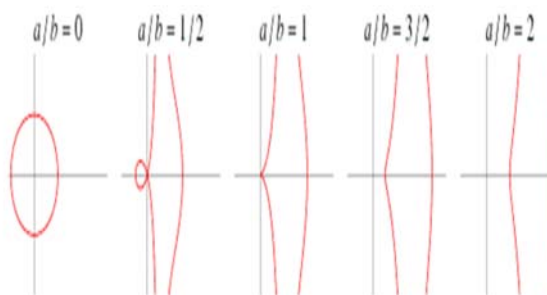
B.Stereometric Construction

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C.Qualities

Nicomedes recognize the three distinct forms seen in this family for $0 < a/b < 1$, $a/b = 1$ and $a/b > 1$.

For $a=0$, it degenerates to a circle.

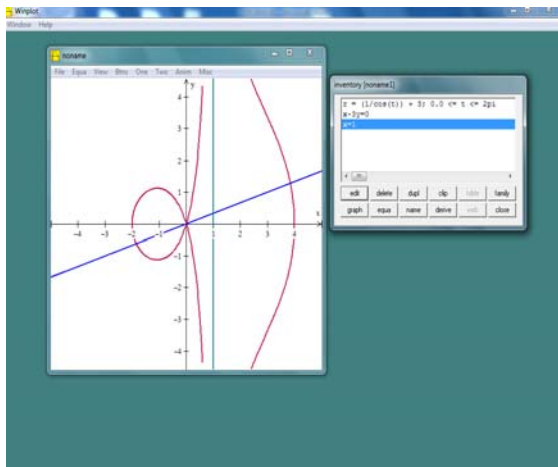


D.History

Nicomedes, an ancient Greek scholar who lived between 250 and 150 B.C., gave the name conchoid to the curve PAQ, because of its similarity to the shape of a mussel shell. He introduced this curve as a graphical solution to the problem of trisecting an angle α .

As now, this problem can be solved with straightedge and compass only for a special chosen angle α (for example $\alpha = \frac{\pi}{2}$). Thus the problem of trisecting an angle $\alpha = \frac{\pi}{3}$ cannot be solved with straightedge and compass alone (that is, if we construct only straight lines and circles). However, the problem can be solved if we invoke other curves, for instance the conchoid. To construct it Nicomedes built a special instrument called a conchoidograph.

E. Construction of Conchoid of Nicomedes Curve Using Winplot



IV. CONCLUSION

This paper by using Winplot mathematical software found various novel ways of drawing curves in the classroom and the learners could visualize their curves in this software. The teachers are encouraged to develop various strategies and ideas in teaching and learning mathematics by using technology.

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