***CONIC SECTIONS - EQUATION OF 2nd ORDER - v1.03***

This program finds the type of conic sections, if the general equation of 2nd order is given in the form:

**a0\*x² + b0\*x\*y + c0\*y² + d0\*x + e0\*y + f0 = 0**.

To run the program, load the file ConicSection.hpprgmto the Prime. Press the Vars-key, then touch the CAS-field, select Program / ConicSection and complete to Conicsection(a0,b0,c0,d0,e0,f0). Press Enter to display the type of conic section as well as its characteristic equation, the center of the curve ( for ellipses referred to the rotated ξ,η-system as well as to the x,y-origin ), axes and angle of rotation. Pressing Enter changes to the Advanced Graphing App and depicts the plot of the figure including the rotated ξ,η-system. Keying Enter again returns to the Home-screen displaying the center (x,y) and angle of rotation. The following examples demonstrate the handling.

***Example: 1.***)

To examine the equation 9\*x² + 24\*x\*y + 16\*y² -240\*x+180\*y = 0 enter ConicSection(9,24,16,−240,180,0) which describes the parabola ξ² + 12\*η = 0 with semi-parameter p=6

and angle of rotation φ ≅ 53.13° :

"Parabola !"

1\* (ξ- 0 )2 +  12\* (η- 0 ) = 0

p =  6

Angle of rotation =  53.13 ° . Press Enter to display the Advanced Graphing-screen.

***Example: 2.***)

ConicSection(36,−24,29,120,−290,545) is the input of the ellipse :(ξ-4)² / 9 + (η-3)² / 4 = 1 with center at (4 | 3) in the rotated ξ,η-system, axes a=3 and b=2 , φ ≅ 53.1°:

\*\*\* Ellipse \*\*\* !

1/9 \*(ξ-4)2 + 1/4\*(η-3)2 = 1

M (ξ,η − system) = ( 4 | 3 )

a = 3, b = 2

M (x,y − system) = ( 0. | 5. )

Angle of rotation =  53.13 ° . Press Enter to display the Advanced Graphing-screen. A tiny little pixel indicates

the centre M(x,y). ( Maybe you must change the colour !)

***Example: 3.***)

To examine x² + 4\*x\*y + y² - x + y - 7 = 0 enter

ConicSection(1,4,1,-1,1,-7) to find :

\*\*\* Hyperbola \*\*\* !

6/13\*(ξ- 0 )2 +  -2/13 \*(η-√(1/2)  )2 = 1

M = ( 0 | √(1/2) )

a =  √(13/6) , b =  √(13/2)

M (x,y − system) = ( -1/2 | 1/2 )

Angle of rotation =  45° . Press Enter to display the Advanced Graphing-screen. A tiny little pixel indicates

the centre M(x,y). ( Maybe you must change the colour !)

***Example: 4.***)

To scrutinize the equation 3\*x2 + 3\*y2 - 12\*x + 18\*y - 9 = 0 input ConicSection(3,0,3,-12,18,-9), press Enter.

Result:

\*\*\* Circle \*\*\* !

(x -  2 )² + (y -  −3 )² =  16

M = ( 2  |  −3 ), r =  4 . Press Enter to display the Advanced Graphing-screen.

There may be errors for extreme results like "imaginary" lines especially if the section is performed in the top of the cone, nevertheless should the program be "foolproof" for a normal ellipse, parabola or hyperbola. Check the results you get from the program !

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