*ELLIPSE, SECANT, TANGENTS v1.02*

Given an ellipse E: (x - xM)2/a2+ (y - yM)2/b2 = 1 ( xM, yM: center of E, a: semi-major axis, b: semi-minor axis ) in combination with

1. a point P0 (x0,y0) outside E or
2. Pc (xc,yc) inside E or
3. a straight line f(x) = m\*x + n

this CAS-program finds several items like tangential points P1, P2, equations of tangents T1, T2, equation of the secant f(x),secant having Pc as midpoint, lengths of T1, T2 and chord between P1, P2 on f(x),secant, angle between T1, T2 and the area of the triangle formed by T1, T2 and the chord. Finally the graph of ellipse and lines is depicted.

The input routine for these cases is as follows:

1. EllipseTang(xm,ym,a,b,x0,y0,0)
2. EllipseTang(xm,ym,a,b,xc,yc,0)
3. EllipseTang(xm,ym,a,b,m,n,1) (The last variable differentiates between *I)* or *II)* and *III)*

Load EllipseTang to the Prime, press the Vars-key, touch the CAS-field on the screen and select

*2 Program*. Then choose EllipseTang and fill out the brackets. The further execution is demonstrated by the following examples:

Example to case *I)* Given E: (x-1)2/52 + (y+3)2/32 = 1 and P0 (8,-12/5). Find P1, P2, T1, T2 , f(x),secant ,  and the areaenclosed byT1, T2 and the chord on f(x),secant.

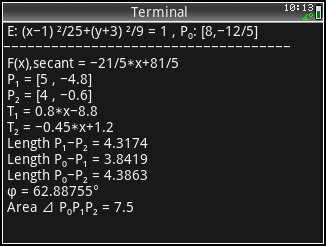
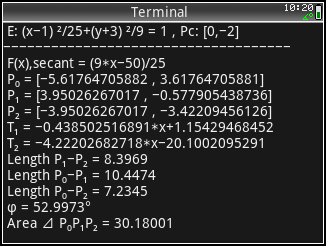
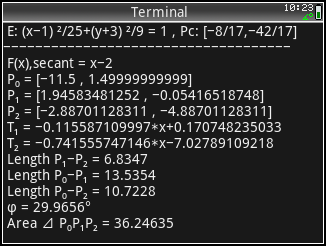
Input EllipseTang(1,-3,5,3,8,-12/5,0) and press Enter. Result: fig. 1), press Enter: fig. 4) .

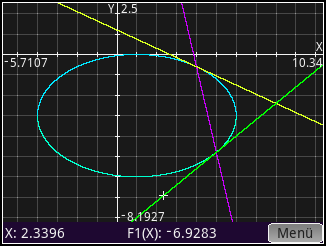
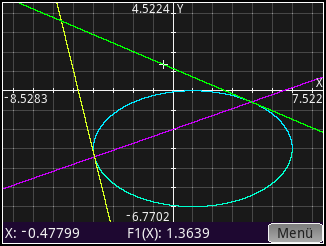
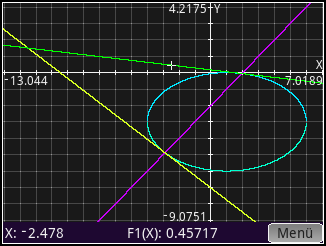
Example to case *II)* Being given the same ellipse, change the point now to Pc (0,-2):

Input EllipseTang(1,-3,5,3,0,-2,0) and press Enter. Result: fig. 2), press Enter: fig. 5) .

Example to case *III)* The same ellipse as above in combination with f(x) = x - 2:

Input EllipseTang(1,-3,5,3,1,-2,1) and press Enter. Result: fig. 3), press Enter: fig. 6) .

 1)  2)  3)

 4)  5)  6)

Now press the home-screen key to display all results once again in a matrix.

With a = b the problem reduces to a circle in combination with tangents, which also can be solved by program “*CIRCLE, SECANT, TANGENTS*” in the same archive category.

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