TANGENT & NORMAL LINE V1.10

This program finds the tangent line to a curve in a common point on the curve (**PNTONCURVE**) or calculates the tangent's equation of a line through a point P1 ($x_p|y_p$) outside the curve (**PNTOUTCURVE**). For both cases the calculation of the normal line in the tangent point is included.
Load ***tangline.8xp*** to the calculator and press **prgm**. Then select **EXEC** **TANGLINE** and press **enter** twice. Follow the instructions for the examples.

EXAMPLE 1:
Given f(x) = x³ - 3x² + 2x . Find the tangent to the curve in x=2.
Start **TANGLINE** . The program now prompts to enter a point on the curve **PNTONCURVE** or outside the curve **PNTOUTCURVE** . Select **1** (default) and enter the equation of F(X):
X³ - 3X² + 2X .
For the point on the curve enter XT: **2** .
The results are given in the graph-screen as curve of the function f(x), normal and tangent line, n(x) and t(x), tangent point **XT=2, YT=0** and the equations **N(X)=-0.5*X+1**, **T(X) = 2*X - 4** .

EXAMPLE 2:
Given the same curve as above. Find the tangent line to f(x) going through point P₁ (2|-0.5) outside f(x). Start **TANGLINE**. The program now prompts again to enter a point on the curve **PNTONCURVE** or outside the curve **PNTOUTCURVE** . Select **2** and enter the equation of F(X):
X³ - 3X² + 2X , followed by: XP: **2** , YP: **-.5** .
Now you have to make a guess for the tangent point and an input for the lower and upper bounds to search:
GUESS: **1**
LOWER: **1**
UPPER: **2**
After some seconds of calculation the graph-screen displays the curve, the tangent and normal line and the numerical results:
N(X)=4*X-6.375, T(X)=-0.25*X+7E-13= -0.25*X , **XT=1.5, YT=-0.375** . The program **pauses here**, press **enter** to see the prompt:
CONTINUE WITH
1:NEW GUESS
2:NEW XP,YP
3:EXIT.   Press **enter** (**1** is default) to input a new guess for another tangent line (**same** point P₁ !).
Enter:
GUESS: **2**
LOWER: **2**
UPPER: **5**
Result presented on the graph-screen: **N(X)=-0.2175*X+1.69758, T(X)=4.5981*X-9.69615, XT=2.366, YT=1.183** .
Press **enter**. Program again returns to the **CONTINUE WITH** -prompt. Press the **enter**-key, then input:
GUESS: **.5**, LOWER: **.4**, UPPER: **.8** and you will get the third tangent through (2|-.5) …..!
For a new point (x_p|y_p) press key **2** **in the CONTINUE WITH –prompt, to finish program execution press 3 !**

NOTE: It is important to make a "good" choice for the guess and/or the bounds, otherwise the program displays an error message ! .

Claus Dachselt
clan.dachselt@t-online.de