

## **PERPENDICULAR & TANGENT LINE V1.01**

This program finds the perpendicular (normal) line to the graph of a function  $f(x)$  through a given point  $P_N(x_N|y_N)$  outside the curve and computes additionally the equation of the tangent line in the common point  $(x_T|y_T)$  on the curve.

Load ***tangline.8xp*** to the calculator and press **prgm**. Then select **EXEC PERPLINE** and press **enter** twice. Follow the instructions for the example.

### **EXAMPLE 1:**

Given is the function  $f(x)$ :  **$5x^3/54-5x^2/9+11x/18+34/27$** . Find the perpendicular line to the graph of  $f(x)$  going through point  $P_N(3|3)$  outside  $f(x)$ . Start **PERPLINE**. The program now prompts to enter the term of the function. Key in the equation as

**$5X^3/54-5X^2/9+11X/18+34/27$**  **enter**, then enter:  $XN: 3$  ,  $YN:3$  and make a guess for  $x_T$  on the curve, i.e. GUESS  $x_T: 1$  .

After some seconds of calculation the graph-screen displays the curve, the tangent and normal line and the numerical results ( here rounded ):

**$N(X)=2.0*X+-3.0$ ,  $T(X)=-0.5*X+2$ ,  $x_T=2.0$ ,  $y_T=1.0$**  . The program **pauses here**, press **enter** to see the prompt:

### **CONTINUE WITH**

**1:NEW GUESS** -----> default!

**2:NEW  $x_N, y_N$ :**

**3:EXIT.** Press **1** or **enter** to input a new guess for another normal line (**same** point  $P_N$  !). As you can see, there is another point near  $x_T=4$ , where the normal line through  $(3|3)$  intersects the curve in a right angle. So enter:

GUESS  $x_T: 4$

Result presented on the graph-screen:  **$N(X)=-3.5399*X+13.6197$ ,  $T(X)=0.2825*X-0.4405$ ,  $x_T=3.6784$ ,  $y_T=0.5985$**  .

Press **enter**. Program again returns to the **CONTINUE WITH** -prompt. Press again **1** or **enter**, then input: GUESS: **5**, and you will get the third normal line through  $(3|3)$  with the results:

**$N(X)=-0.5*X+4.5$ ,  $T(X)= 2.0*X-8$ ,  $x_T=5$ ,  $y_T=2$**  .

**For a new point  $(x_N|y_N)$**  press key **2** **in the CONTINUE WITH -prompt, to finish program execution press 3 enter !**

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

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