Euler's Method (TI-81)

This program for the TI-81 calculates and graphs an approximate solution for the differential equation \( y' = f(x, y) \) using Euler's method.

The function \( f \) is entered as \( Y_1 = f(X, Y) \). When called, the program asks for the coordinates of the starting point and the step size. The graph is then drawn. The program does not clear the screen to start with, so solutions with different starting points or step sizes can be graphed consecutively on the same axes, or solution curves can be superimposed on a slope field. When the program is finished, the final \( Y \)-value remains in cell \( Y \).

\[
\text{Prgm: EULER} \\
\text{:All-Off} \\
\text{:Disp “INITIAL X”} \\
\text{:Input X} \\
\text{:Disp “INITIAL Y”} \\
\text{:Input Y} \\
\text{:Disp “STEP SIZE”} \\
\text{:Input H} \\
\text{:Lbl P} \\
\text{:X + H \to U} \\
\text{:Y + H \times Y_1 \to V} \\
\text{:Line(X, Y, U, V)} \\
\text{:U \to X} \\
\text{:V \to Y} \\
\text{:Goto P}
\]

Where to Find The Commands

- All-Off is a single symbol from the 2nd VARS OFF menu.
- Disp and Input are single symbols from the PRGM I/O menu.
- Lbl and Goto are single symbols from the PRGM CTL menu.
- \( Y_1 \) is a single symbol from the 2nd VARS menu.
- Line( is a single symbol from the DRAW (i.e., 2nd PRGM) menu.

To run this program:

1. Enter \( y' = f(x, y) \) as \( Y_1 = f(X, Y) \).
2. Choose an appropriate RANGE.
3. Run the program; if you have seen enough of the trajectory, press ON and 2. Then press ENTER to continue with other initial values, or another step size.
4. To get rid of previously drawn graphs, press ClrDraw (from the DRAW menu) or change the RANGE.
5. If you get an edgy, disconnected, or otherwise weird graph, try a smaller step size.