

TI-85 Program for Slope Fields - Functions of Two Variables (SLPF3) - ZSQR
Math 142 - Spring Semester 1996
Dr. Carruth

1.	:.65→C	Reduction factor for portion of rectangles covered by line segments ($C \leq 1$).
2.	:ClDrw	Clear any drawing that might reside on the graphing screen.
3.	:FnOff	Unselect any functions (Y1-Y99) for graphing.
4.	:Disp "Enter F(x,y)"	Display the prompt to enter the function.
5.	:InpSt FUNCTION	Command InpSt for accepting function input as a string.
6.	:St•Eq(FUNCTION,F)	Command St•Eq converts the "string" function to a "real" function.
7.	:Disp "Enter yMin"	Display the prompt to enter the lower limit for y values.
8.	:Input yMin	Command Input accepts the input value for the variable yMin.
9.	:Disp "Enter yMax"	Display the prompt to enter the upper limit for y values.
10.	:Input yMax	Command Input accepts the input value for the variable yMax.
11.	:yMin→xMin	Setting xMin=yMin in preparation for autoscaling (ZSQR).
12.	:yMax→xMax	Setting xMax=yMax in preparation for autoscaling (ZSQR).
13.	:ZSqr	Autoscaling to <i>square things up</i> .
14.	:Disp "Enter Nx"	Display the prompt to enter the number of horizontal line segments to use.
15.	:Input NX	Command Input accepts the value Nx for the variable NX.
16.	:Disp "Enter Ny"	Display the prompt to enter the number of vertical line segments to use.
17.	:Input NY	Command Input accepts the value Ny for the variable NY.
18.	:(xMax-xMin)/NX→H	Calculating the width of horizontal intervals and assigning it to the variable H.
19.	:(yMax-yMin)/NY→V	Calculating the height of vertical intervals and assigning it to the variable V.
20.	:I→I	Starting the I-loop by setting I=1 (first row).
21.	:Lbl A	Establishing a label for the subroutine (for Goto) to <i>move up the rows</i> .
22.	:I→J	Starting the J-loop by setting J=1 (first column).
23.	:Lbl B	Establishing a label for the subroutine (for Goto) to <i>move across the columns</i> .
24.	:xMin+(J-1)*H+H/2→x	Calculating the x-coordinate of the center of the (I,J) rectangle.
25.	:yMin+(I-1)*V+V/2→y	Calculating the y-coordinate of the center of the (I,J) rectangle.
26.	:F→M	Evaluating F(x,y) at the point (x,y) and assigning the value to the variable M (slope).
27.	:y-M*C*H/2→S	Determining the y-coordinate of the left endpoint of the slope line segment (S).
28.	:y+M*C*H/2→Z	Determining the y-coordinate of the right endpoint of the slope line segment (Z).
29.	:x-C*H/2→P	Determining the x-coordinate of the left endpoint of the slope line segment (P).
30.	:x+C*H/2→Q	Determining the x-coordinate of the right endpoint of the slope line segment (Q).
31.	:If abs (Z-S)>C*V	Checking to see if the difference in y-coordinates is too large (want C*V).
32.	:Goto D	If the difference in y-coordinates is too large, go to Lbl D to scale it down.
33.	:Lbl E	If the difference in y-coordinates is OK, plot the line segment joining (P,S) to (Q,Z).
34.	:Line(P,S,Q,Z)	Sketching the slope field line segment in the (I,J) rectangle.
35.	:IS>(J,NX)	Testing to see if J has reached NX. If not, add 1 to J. Otherwise skip the next step.
36.	:Goto B	J has been increased by 1 (next rectangle/column in Row I) - repeat subroutine B.
37.	:IS>(I,NY)	Testing to see if i has reached NY. If not, add 1 to I. Otherwise skip the next step.
38.	:Goto A	I has been increased by 1 (next row up) - repeat subroutine A for this row.
39.	:Stop	End of program. While it has been running, the slope field graph has been generated.
40.	:Lbl D	Subroutine to scale down the vertical portion of line segments if they are too large.
41.	:y-V/2→S	Making the y-coordinates of the left endpoint lie on the upper or lower edges. *
42.	:y+V/2→Z	Making the y-coordinates of the right endpoint lie on the upper or lower edges. *
43.	:(S-y)/M+x→P	Rescaling the x-coordinate of left endpoint to keep the slope = M after adjusting S.
44.	:(Z-y)/M+x→Q	Rescaling the x-coordinate of right endpoint to keep the slope = M after adjusting Z.
45.	:Goto E	Going back to sketching the slope field line segment in the (I,J) rectangle after rescaling.

* If M is positive the left endpoint will lie near the lower edge, whereas if M is negative, the left endpoint will lie near the upper edge.

Note: The symbol → represents STO on the calculator, but it appears as -> on the edit screen.

Note: This program may be transferred from my calculator to yours!

Note: If you set Nx>12 and/or Ny>8, be prepared for a slow graph generation!

Warning: When addressing the first question asked in class on Wednesday, March 13, 1996, it is not enough to reset the H/2 values in Steps 25-28 to adjust the x-coordinates of endpoints of slope field line segments. One must also adjust the rescaling of y-coordinates of these endpoints both in the conditional statement in Step 29 and in Subroutine D. Otherwise, an accurate slope field will not be generated by the program.