

GG250 Lab 3

3-D Visualization with Matlab

This lab introduces methods for visualizing functions of two variables to find the maximum and minimum values of the function. Before you get going, go to Matlab's on-line help and read the material on the following topics:

- 1 3-D Visualization -> Creating 3-D Graphs -> A Typical 3-D Graph
- 2 The following Matlab functions: meshgrid, peaks, contour, clabel, surf, surfli, view, quiver, Text Properties (see 'Greek Letters'), min, max, and axis.

Exercise 3_1 (Script file)

Prepare one script that produces two separate figures: a surf plot and a contour plot.

Before each "active command" in the script, insert a comment line saying what the following "active command" does. Take time to compare the plots to see which seems more useful to illustrate the solution here. My script for "the answer", with comments, is 55 lines long.

- a) Title the script gg250_lab_03_1_yourname, and include your name on the second line of the script.
- b) **Figure 1.** Use Matlab help for the function 'surfli' to create a template script. Have the first part of your script prepare a surf plot (not a surfli plot) of the peaks function for an x,y grid that goes from x = -2.5 to +2.5 and y = -2.5 to +2.5. Let the grid increment be 0.1. Label the axes in a way you deem appropriate. Instead of calling the values of the peaks function "z", call the values "phi".
- c) Go to the tools menu in the figure window for figure 1 and set the camera motion to "orbit camera", and then drag the mouse around on the figure window to spin the figure (play around with this – the effects are really quite remarkable). Spin the figure to an orientation such that you can most easily see what the maximum and minimum values of the function are.
- d) Put a title on the plot that says 'The maximum value of ϕ is **', where ** is the maximum value you observed.
- e) **Figure 2.** Using the example script for the function 'quiver' as a template, have the second part of your script prepare a labeled contour plot of the peaks function for an x,y grid that goes from x = -2.5 to +2.5 and y = -2.5 to +2.5, but let the grid increment here be 0.2. Label the axes as "x" and "y". Instead of calling the values of the peaks function "z", call the values "delta" (Δ). Set the scale on the x and y-axes the same using the 'axis' function.
- f) Superpose on Figure 2 a quiver plot that uses the gradient function that shows the direction and steepness of the slope of the function. Insert some minus signs into appropriate places in the argument list to make the arrows point "downhill".
- g) Use the functions 'max' and 'min' to find the maximum and minimum values of delta.
- h) Put a title on the plot that says a title on the plot that says ' $\Delta_{\max} = **$, $\Delta_{\min} = ***$ ', where ** is the maximum value of delta you obtained from the function 'max', and *** is the minimum value of delta you obtained from the function 'min'.

- i) In an e-mail to gq250-lab@hawaii.edu, attach the completed script, and list the subject in the e-mail as "gg250_lab_03_1 "