Econ 172A
Fall 2003

Due: October 14, 2003, in class
Warning: No late papers

Problem Set I

The purpose of this assignment is to make sure that you can use Excel. If you own a copy of Excel (with Solver installed), use it. Otherwise, you may work in the Social Science Computation Lab (Econ 100).

You should be able to do the problems now (or shortly after reviewing the lecture notes: http://www.econ.ucsd.edu/~jsobel/172aw02/notes4.pdf) on Excel. I will not discuss the computer program during lecture. Using Excel can be frustrating. I encourage you to try to do these problems now instead of waiting until the night before they are due.

Notes:

- You do not yet know how to interpret the information that Excel provides on sensitivity analysis. There is no need to include Excel sensitivity reports with your answers.
- You may work with others, but you must submit your own work.
- Clearly label your computer output (you can do this by carefully labeling your Excel spreadsheets or by annotating your printouts). Identify your answers and **describe them**

1. a. Use Excel to solve.

MAX $15x_1 + 10x_2 + 9x_3 + 2x_4$

SUBJECT TO

$2x_1 + x_2 + 5x_3 + 0.6x_4 \leq 20$

$3x_1 + x_2 + 3x_3 + .25x_4 \leq 24$

$7x_1 + x_4 \leq 70$

$x \geq 0.$

(You can begin by copying the template as explained in the lecture notes.)

Parts b and c vary the original problem. To save time, you can save the original problem after you type it into the spreadsheet. There are a few ways to do this. I recommend copying the page. Select the page where you created the spreadsheet for part a, bring down menu: "Edit;" select "Move or Copy Sheet …;" check the make a copy box in the "Move or Copy" dialog box; (you can now decide where you want the copy to go); click ok. The copy will have a name like "Problem 1a (2)". You should right click on the tab with the name of the worksheet and rename it something useful.

b. Change the original problem by turning the first constraint (the one that requires $2x_1 + x_2 + 5x_3 + .6x_4 \leq 20$) into an equation. Print out the new problem, the solution, and

identify the optimal value of each variable on the printout. Compare the value of the objective function in parts a and b. Explain this relationship intuitively.

c. Change the original problem by turning the objective function into minimize (instead of maximize). Print out the new problem, the solution, and identify the optimal value of each variable on the printout. Explain why you should have been able to guess this solution in advance.

d. Change the original problem by removing the requirement that $x_4 \geq 0$. Print out the new problem, the solution, and identify the optimal value of each variable on the printout. Compare the value of the objective function in parts a and d. Explain any differences.

e. Change the original problem by changing the right-hand side of the second constraint from 24 to 20. Print out the new problem, the solution, and identify the optimal value of each variable on the printout. Compare the value of the objective function in parts a and e. Could you have guessed this solution in advance? What if you changed the right-hand side to 16? or to 28?

2. a. Use Excel to solve: max $x + 4y$ subject to: $3x + y \leq 20$, $-2x + y \geq 5$, $x, y \geq 0$.

b. Solve the problem again using the objective function
i. max $x + 3y$ ii. max $x - y$

In both parts, print out the problem, the solution, and identify the optimal value of each variable on the printout.

c. How do the solutions to the two parts in (b) compare to the solutions to solution in (a). Explain. [Only write one sentence, of the form "the solution did not change because ..." or "the solution changed because ..."]

d. Use graphical methods to solve parts (a) and (b) and compare your answers to the answers you found using Excel.