

HOMework #1

INSTRUCTIONS FOR ALL HOMEWORK ASSIGNMENTS AND PROJECTS

Each group should turn in a **hard copy** of the solutions to the exercises with the name of each person in that group. Do not include any spreadsheets unless you are asked to do so (for example, in Exercise 1 below). HOWEVER, please indicate how you obtained your answer. **Note:** In this and all future homeworks, you will find all Excel files in DataFiles.zip posted in *Canvas*.

1. For each of the following problems, use an existing EXCEL spreadsheet from the specified data file that includes the data and the model. Then use a trial-and-error approach to solve the problem. Turn in a printout of your final spreadsheet with the best values for the variables that you find and the corresponding value of the objective function. Also, keep your EXCEL files of these problems for future homework assignments.
 - (a) The Product-Mix Problem of BlubberMaid (see the file blubber.xls). (2 points)
 - (b) The Make-Or-Buy Problem of MTV Steel (see the file MakeOrBuy.xls). (3 points)
 - (c) The Energy Problem of Lilliput on page 11 in Section 1.2 of your textbook (see the file energy.xls). (5 points)
2. On the basis of all your experimentation in the previous exercise, identify three difficulties with using a trial-and-error approach to solve these types of models. (5 points)
3. Fresh Dairy Farms has two different machines for processing raw milk into low-fat milk, butter, and cheese. The amount of time required on each machine to produce each unit of resulting product and the net profits are provided in the following table:

	Low-fat Milk	Butter	Cheese
Machine 1	0.2 min/gal	0.5 min/lb	1.5 min/lb
Machine 2	0.3 min/gal	0.7 min/lb	1.2 min/lb
Net Profit	\$0.22 /gal	\$0.38 /lb	\$0.72 /lb

Assuming that 8 hours of time are available each day on each machine, as manager of the Production Department, formulate a model to determine a daily production plan that maximizes the net corporate profits and yields a minimum of 300 gallons of low-fat milk, 200 pounds of butter, and 100 pounds of cheese. (Note: Any amount of milk can be produced on either machine without having to use the other machine. The same is true for each of the other two products.) Build a mathematical model using variables, an objective function, and constraints. Is your model an LP? Why or why not? Explain. (15 points)

4. The Leather Company produces baseball gloves, footballs, and leather straps using raw leather that is processed on a machine. For the coming week, there are 1000 square meters of leather and 40 hours of machine time available. The manager wants to determine a production plan for this week that maximizes the net corporate profits.
- (a) Identify the variables. (5 points)
 - (b) Identify and assign a symbolic name to each *additional* data value you would have to obtain to be able to formulate a mathematical model. (5 points)
 - (c) Formulate a model using the variable names from part (a) and the symbolic names for the data from part (b). Is your model an LP? Why or why not? Explain. (5 points)
5. Every two weeks, Florida Citrus, Inc., uses a single machine for 80 hours to distill orange and grapefruit juice into concentrates that are then stored in two separate 1000-gallon tanks before being frozen. The machine can process 25 gallons of orange juice per hour but only 20 gallons of grapefruit juice. Each gallon of orange juice cost \$1.50 and loses 30% in water content when distilled into a concentrate that then sells for \$6.00 per gallon. Each gallon of grapefruit juice costs \$2.00 and loses 25% when distilled into a concentrate that then sells for \$8.00 per gallon. Formulate a model to determine a production plan to maximize the profit for the next two weeks using the following variables: (15 points)
- OJ = the number of gallons of orange juice to use,
 GJ = the number of gallons of grapefruit juice to use.
6. Review all of the linear algebra in Sections 4.1 – 4.4 of your textbook.
7. If you have not already done so, follow the instructions in the file EXCEL_AddIns_PC.pdf or EXCEL_AddIns_MAC.pdf to install both Solver and OpenSolver as an Add-In to EXCEL on your WINDOWS or MAC computer. If you have any problems with this please see the TA during office hours (or make a special appointment).