Business 515 - Computer Take-Home Problems - **Prof. Richard B. Goldstein**

#1 LINEAR PROGRAMMING (10%)

Sunshine Juices sells three juice mixtures: Tropical Blend, Hawaiian Blend, and Florida Special. Tropical Blend contains a mixture of orange, grapefruit, pineapple, and guava juices. Hawaiian Blend contains a mixture of grapefruit, pineapple, and guava juices. Florida Special is a mixture of only orange and grapefruit juices.

The cost of each juice is as follows:

orange	$4.40/gallon
grapefruit	4.00/gallon
pineapple	4.90/gallon
guava	6.40/gallon

and the blends sell for:

Tropical Blend	$7.20/gallon
Hawaiian Blend	6.70/gallon
Florida Special	5.40/gallon

Available at the moment are [eq #1] 1,500 gallons of orange juice, [eq #2] 900 gallons of grapefruit juice, [eq #3] 600 gallons of pineapple juice, and [eq #4] 600 gallons of guava juice. There is a demand for at least [eq #5] 900 gallons of Tropical Blend, [eq #6] 600 gallons of Hawaiian Blend, and [eq #7] 1,200 gallons of Florida Special.

The mixing conditions for Tropical Blend [eq #8] require at least 30% orange juice, [eq #9] at least 20% grapefruit juice, and [eq #10] at least 20% guava juice. Similarly, Hawaiian Blend must contain [eq #11] at least 25% grapefruit juice, [eq #12] at least 40% pineapple juice, and [eq #13] at most 50% pineapple juice. Finally, Florida Special must contain at [eq #14] least 40% orange juice and [eq #15] at most 70% orange juice.

HINT Let X1 = Gallons of orange juice in Tropical Blend
X2 = Gallons of grapefruit juice in Tropical Blend
: = :
X9 = Gallons of grapefruit juice in Florida Special

QUESTIONS:

(1) What is the maximum profit?
(2) How many gallons of each juice are used?
(3) How many gallons of each Blend are sold?
(4) What is the percentage of each juice used in each of the Blends?
(5) How much more profit can be made with one additional gallon of orange juice? Repeat for guava juice.

#2 DECISION ANALYSIS (10%)

The Palm Garden Greenhouse specializes in raising carnations that are sold to florists. Carnations are sold for $18 per dozen; the cost of growing the carnations and distributing them to the florists is $11 per dozen. Any carnations left at the end of the day are sold to local restaurants and hotels for $6 per dozen. The estimated cost of customer ill-will when demand is not met is $8 per dozen. The expected daily demand (in dozens) for the carnations is shown below.

Daily Demand	Probability
20	0.15
25	0.25
30	0.40
35	0.15
40	0.05
	1.00

A. Develop the 5 X 5 payoff table for this decision problem.

B Compute the **expected value** of each alternative that could be stocked and select the best alternative. Compute the **Expected Value** with and of Perfect Information.

C. Construct the **opportunity loss table** and determine the **minimax regret**.

D. Find the best strategy **without** the probability information using

(I) OPTIMIST/maximax

(II) PESSIMIST/maximin

(III) HURWICZ/α=0.4 (not in package – use results from I and II)

(IV) LAPLACE/equally likely (change p = 0.2 for each)

#3 GAME THEORY (5%)

Consider the following zero-sum game payoff table for two players:

Player I	Player II Strategies				
Strategies	A	B	C	D	E
#1	5	3	-6	-2	9
#2	4	9	3	-7	-1
#3	1	1	4	3	0
#4	-5	6	7	9	-2

A pure strategy is not possible for this game. Determine the mixed strategy for each player using linear programming or http://people.hofstra.edu/faculty/Stefan_Waner/gametheory/games.html. Find the value of the game and the probabilities associated with each strategy.