**Homework Chapter III -IV**

1. Farmer Joan Bottom has a small farm on which she grows three types of crops: cotton, corn and hay. Joan seeks to determine the amount of each crop she should grow so as to maximize net returns.

 The scarce resources Joan must allocate are 640 acres of land and 1150 acre ft of water.

 From previous experience, Joan has developed the following information per acre of crops grown:

 Sorghum Corn Hay

 Land\_use 1 1 1

 Water\_use 1 2 3

 Yield\_per\_acre 72 180 3

 Sale\_price\_per\_unit 5.50 3.5 80

 Cost\_of\_production 190 350 75 ;

 a. Set up and solve this problem

b. Interpret at least 2 elements from the numerical counterparts of each the following terms at optimality

i. CB B -1

ii. B -1

iii. B -1 b

iv. CB B -1 b (one element only)

v. CB B -1 ANB - CNB

 2. Solve the following by excel, GAMS or by hand

 Max 5 x1+ 2x2

 s.t. 2 x1 + x2 < 12

 x1 < 2

 x2 < 4

 x1 , x2 > 0

Explain the variables and shadow prices

 3. Solve the following

 Max 4 x1+ 2x2

 s.t. 2 x1 + x2 < 12

 x1 < 11

 x2 < 6

 x1 , x2 > 0

Explain the reduced costs and variable values

4. Write the dual of problem 1

Interpret the dual equations

Tell what the solution to the dual is for its variables, shadow prices, reduced costs and objective function.

5. Take the problem

 Max 3\*x1 +2\*x2 -1\*x3

 s.t. x1 + x2 + x3 < 10

 x1 +x2 > 5

 -x2 + x3 =1

And add variables to both convert the constraints to equalities and permit selection of a feasible initial basis.