Project # 1: The Blending Problem of Hexxon Oil
Part II: Managerial Questions

For the blending problem of Hexxon Oil, Mr. Sam Barton, the production manager, needs to determine the maximum-profit plan for producing Regular, Unleaded, and Supreme gasoline. To develop the desired production plan, use the two formulations in the solutions to Part I of this project that were handed out in class together with the file hexxon.xls and your computer package to solve the linear programming formulation. Prepare a managerial report following these guidelines.

(a) Prepare a table indicating how many barrels of each constituent to blend in making each gasoline. Indicate the total amount of each constituent used, the amount of each type of gasoline produced, and the total daily corporate profits. (5 points)

(b) In formulating the problem, the minimum octane rating of Regular, Unleaded, and Supreme is specified as 90, 96, and 100, respectively. What is the *actual* octane rating of each gasoline based on the optimal blending plan? (5 points)

(c) Mr. James Arden, vice president of production, wants to know how sensitive the current production plan is to an increase in the selling price of Supreme gasoline. Explain why, in this particular model, you should not use a sensitivity report to answer this question. (10 points)

(d) By how much must the selling price of Supreme gasoline increase before Hexxon can attain a daily corporate profit of $68,000, assuming all other prices and costs remain fixed? (Hint: Try different values.) (10 points)

(e) Suppose the demand for Unleaded gasoline increases to 4100 barrels. What is the new production plan and daily profit? Looking at the new production plan and without referring to the shadow price, explain why the daily corporate profits have decreased, even though the demand for Unleaded gas has increased. (10 points)

(f) Use your linear programming package to solve the second model with the new nonlinear objective function you have been given. Report the solution in the form of your answer part (a) above. (Hint: "Guess" a value for the amount of Constituent 1 to be blended in making Supreme gasoline, for example, x_{1s} = 1000 gallons. Then determine the objective function coefficient of this variable, which would be 8.00 for this example. Include an appropriate constraint to force the value of the variable x_{1s} to have the guessed value (1000, in this example) throughout the model. Then solve the resulting linear program. Continue guessing new values for this variable x_{1s} in an intelligent way and solving the resulting linear programs.) (15 points)