Compose your answers to the problem set in excel. Because skill with excel is part of this exercise, we will reward compliance with the following instructions. Shrink column widths etcetera so that the answers to problems one and two are printed on one side of one sheet of 8.5 × 11 paper. Your name should be printed in the upper right hand corner. The answer to problem three should be printed on (part of) one side of one sheet of 8.5 × 11 paper. Again, your name should be in the upper right-hand corner. Please don’t ask us to decipher ugly, sprawling answers.

We do not need to see your formulas. We trust you. Just print out the results. If you work in a group, which is recommended, do not simply copy the group solution and turn it in. After the group settles on solutions, each member should independently recreate the solutions and formats and turn in his or her unique product.

1. This is an exercise in using excel and solver. Go to the class web site and find the excel spread sheet that demonstrates solver. Start with the second template given in the introductory page. You may recognize that it is the Wyndor-Glass problem. Modify the template and use the modified version to solve both the primal and dual of the following problem. Comment on any difficulties you had in modifying the template.

   \[ \text{Maximize } 3x_1 + 4x_2 + 2x_3 + 5x_4 \]  
   \[ \text{subject to } \begin{align*} 
   x_1 + x_2 & \leq 8 \\
   2x_3 + 2x_4 & \leq 12 \\
   3x_1 + 2x_2 + x_3 + 2x_4 & \leq 18 \\
   x_i & \geq 0 
   \end{align*} \]

2. This is another exercise in using excel and solver. Start with the template that solved problem one above. Modify the template and use the modified version to solve both the primal and dual of the following problem. In fifty words or less, what is interesting about the solutions?

   \[ \text{Maximize } 3x_1 + 4x_2 + 2x_3 + 5x_4 \]  
   \[ \text{subject to } \begin{align*} 
   x_1 + x_2 & \leq 8 \\
   2x_3 + 2x_4 & \leq 12 \\
   3x_1 + 2x_2 + 2x_3 + 2x_4 & \leq 32 \\
   x_1 + 2x_2 + x_3 + 3x_4 & \leq 20 \\
   3x_1 + 2x_2 + x_3 + 2x_4 & \leq 18 \\
   x_i & \geq 0 
   \end{align*} \]

3. This is another exercise in using excel and solver. Start with the template that solved problem two above. Modify the template and use the modified version to solve both the primal and dual of the following assignment problem. There are three workers and three tasks. One worker must take on each task. The table below gives the time cost of each task if done by each worker. The objective is to assign workers in such a way as to minimize total cost. In a few words, define the notation you use for the problem. Solve primal and dual. Is the solution unique?

   \[ \begin{array}{ccc} 
   \text{Task 1} & \text{Task 2} & \text{Task 3} \\
   \text{Worker 1} & 15 & 16 & 17 \\
   \text{Worker 2} & 14 & 19 & 18 \\
   \text{Worker 3} & 13 & 13 & 16 \\
   \end{array} \]