Due: Friday, February 26th (11:59 p.m. PT.)

References are to the course textbook, except as noted.

Reminders

Enjoy spring break (February 15th-19th).

The midterm exam will take place on **Friday, March 5th**.

The project proposals will take place on the week of **Friday, February 12th**.

Reading

For Wednesday, February 24th, Chapter 6.

For Friday, February 26th, Chapter 7.

For Wednesday, March 3rd, Chapter 8.

For Wednesday, March 10th, Chapter 9.

Note that we do not cover Chapter 5.

Assignment exercises to hand in

Questions 1 and 2 must be solved in a spreadsheet, and must be accompanied by well-written solutions. You should provide full details of how you solved the problems. The `.pdf` files for each question will be submitted in Crowdmark (1 file per question), and the spreadsheets to Canvas. Please do **not** submit `.zip` files (archives).

1. Take the digits of your student id, in order: a_1, a_2, a_3, a_4, a_5, a_6, a_7, a_8 and a_9.

Consider the linear program:

$$\begin{array}{rc} \max & x+y \\ \text{such that} & a_1x + a_2y \leq a_1 + a_2 + a_3 + 3 \\ & a_4x + a_5y \leq a_4 + a_5 + a_6 + 3 \\ & a_7x + a_8y \leq a_7 + a_8 + a_9 + 3 \\ & x, y \geq 0 \end{array}$$

a. Graph the feasible region of this problem.

b. Use `Excel` to solve the linear program. Mark the optimal solution on your graph.

c. Which constraints are binding? Describe the *pattern* of the solution by noting which variables are zero and non-zero, and which inequalities are binding and non-binding. Explain how this relates to the position on the optimal solution on your graph.

d. Perform an analysis describing what happens to the pattern of the solution and the optimal objective value as the co-efficient of x changes. Start with the co-efficient at 0, and increase it by steps of 0.1 to 2. Explain this with reference to the graph.

e. Is the optimal solution to the problem unique, or are there alternative optimal solutions?

f. What range of values of the right-hand side of the first equation retains the same pattern for the optimal solution? Within this range, describe the optimal solution and optimal value of the problem as a function of this right-hand side. Explain this with reference to the graph.

2. Exercises 4.9 and 4.10.

3. By now you will have chosen an interesting article that describes an application of operations research. You will write a brief summary of the article, typeset in LaTeX. The summary that you will produce should be at most 1200 words and fit on two pages (one double sided page) using reasonable margins and an 11- or 12-point font. It should describe the contents of the article **in your own words**.

Your essay should be clearly organized, and should address the following issues:

1. What real-world problem is treated in the paper?
2. What type of mathematical (Operations Research) model is proposed to solve the problem?
3. What data is used in the model?
4. What mathematical tools are used to solve the model? How well is it solved?
5. What are the limitations of the model?
6. How has the solution been implemented? What is the impact of the implementation?
7. What are possible future directions for this work? For instance, can the model be improved? Can it be applied elsewhere?

Particularly on points 5 and 7, you are encouraged to go beyond the contents of the paper, and include your own critical analysis.

Some other exercises you should try

Additional exercises from Chapters 4 and 6.