Due: Friday, February 5th (11:59 p.m. PT.)

Reading

For Wednesday, February 3rd, Sections 3.5 and 3.6.

For Friday, February 5th, Sections 4.1 and 4.2.

Assignment exercises to hand in

Questions must be solved in a spreadsheet, and must be accompanied by well-written solutions, typeset in LaTeX. You should provide full details of how you solved the problems. We have a new plan for assignment submission: the .pdf files will be submitted in Crowdmark (1 file per question), and the spreadsheets to Canvas. Please do **not** submit .zip files (archives).

0. Generate 12 numbers (they won't all be distinct) by taking the last 6 digits of your student id number, and then taking the same digits but adding one. So if your student id is 314159265, your 12 numbers are $1, 5, 9, 2, 6, 5, 2, 6, 10, 3, 7, 6$. This is not a graded problem, and is not to be handed in. However, your list of 12 numbers should be clearly stated in your solutions to problems 1. and 2.

1. Exercise 3.3. However, modify the unit cost matrix by adding the 12 numbers generated in part 0. to the corresponding matrix entries.

2. In class we described how to formulate a shortest path problem as a linear program. Consider the following graph, which has 12 edges:
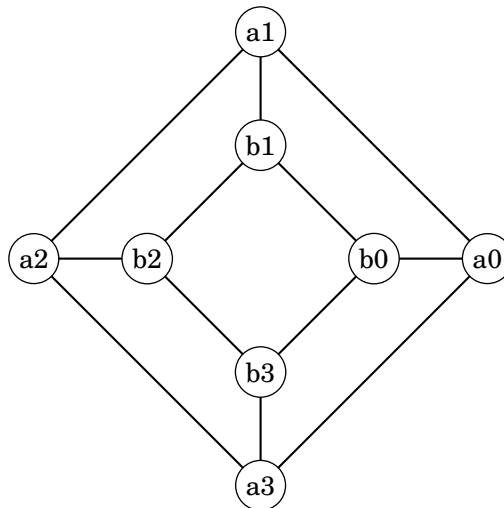
The graph that we saw in class was a *directed graph*, that is, we could cross the edges only in one direction. Here the edges are *undirected* and we could cross them in both directions. This can be handled by "splitting" the undirected edges into pairs of directed edges, pointing in opposite directions. There are then separate variable for crossing each edge from the pair, for example $x_{a0,a1}$ and $x_{a1,a0}$.

a. For the purposes of finding the shortest path from a2 to b0, you may not need to split all the edges to formulation the problem. Explain which edges need to be split and why.

b. Assign "distances" to the edges by placing your 12 numbers from part 0. on the edges starting from the outside cycle, and ending with the inside cycle. Formulate the problem of finding the shortest path from a2 to b0 as a linear program. Solve the problem in Excel.

3. Exercise 3.7. However, replace the final digits of the prices in the wells-to-pumps cost matrix with the corresponding digit in your student id number.

Essay topic

Each student will choose a research article that describes an application of Operations Research, for use on a future assignment.

A good place to start looking for an article is the journal Operations Research. You should find a paper that describes a **specific real-World application** of Operations Research, and includes **quantified results** on **real data**. While *Operations Research* and a few other journals try to collect papers of this type from a range of applications, more often such papers appear in journals dedicated to the relevant applications. These can range from the serious to the fun.

You can access these journals through the SFU library site using your student credentials. (Do not use a journal to which SFU does not have access.) Your paper should be published in the past 10 years.

You should select your article by the deadline for this assignment. Please note the article that you have selected at the end of your solution to problem 3.

Some other exercises you should try

Additional exercises from Chapters 2 and 3.