Network Optimization (Fall 2026): Homework 9

- AMO stands for the text (Ahuja, Magnanti, Orlin). Exercises and page numbers are listed from AMO.
- The total points (given in parentheses) add up to 135. Math 566 students will be graded for 130 points, and Math 466 students for 115 points.

- **Send your submission to kbala@wsu.edu. Your main submission should be in a PDF file**. You are welcome to write answers by hand, and scan the writings (or take pictures of your writings) **into a PDF file**. You can also include output from running your program (for Problem 5) in the PDF file.
- Include all files—the main PDF and any program (.m) files—in a **zipped** folder.
- **You will not be allowed to include .py files in your email attachment. Notebooks (.ipynb files) are allowed. Another option is to rename your .py files as .txt instead.**
- **Your folder name should identify you in the usual manner. If you are Alotta Homeworky, you should name your folder AlottaHomeworky_Hw9.zip. If you want to add more bits to the title, e.g., Math566, you could name it AlottaHomeworky_Math566_Hw9.zip, for instance. But you should start the file name with AlottaHomeworky. Please avoid white spaces in the file name.**

- **Begin the SUBJECT of your email submission with the same `FirstnameLastname`, expression, e.g., "AlottaHomeworky Hw9 submission".**
- **This homework is due by 11:59 PM on Friday, November 6**.

1. (20) **[G]** AMO 6.38 (page 204).
2. (25) AMO 7.7 (page 244).
3. (20) AMO 7.8 (page 244).
4. (35) AMO 7.9 (page 244).
5. (35) Write Matlab (or in another package/language) code that takes as input the forward star representation of a network, a source node s, and a sink node t, and finds the maximum flow using the shortest augmenting path (SAP) algorithm. The code should output the max flow value v as well as the maximum flow m-vector $\mathbf{x}$ (of flows x_{ij}).

   - Name your file as `SAPMaxFlow_FirstnameLastname.m`, e.g., `SAPMaxFlow_AlottaHomeworky.m`, and include the same in your email submission.
   - Solve the instance given in AMO 7.3 (Page 243, Figure 7.21 (a)) as a test case. You **must** include the output for this instance in your submission. You're welcome to include the output as part of the main PDF file itself, or as part of the code submission file (as part of comments, for instance). But if you are sending in a separate file for the output, it must be **in text format** and should be named `Output_SAPMaxFlow_FirstnameLastname.txt`
   - Your function must take **the entire Forward Star matrix as a single input**—from a text file, or it could be typed in as part of separate code that you turn in, for instance. Your code should **not** use node-node adjacency or other related representations of the network. If you insist on using another representation, include a function that creates your representation from a standard forward star representation as discussed in class.