MAE 3210 - Spring 2019 - Homework 5

Homework 5 is due **online** through Canvas in PDF format by 11:59PM on Friday March 8.

You are required to submit code for all functions and/or subroutines built to solve these problems, which is designed to be easy to read and understand, in your chosen programming language, **and which you have written yourself**. The text from your code should both be copied into a single PDF file submitted on canvas. **Your submitted PDF must also include responses to any assigned questions, which for problems requiring programming should be based on output from your code**. For example, if you are asked to find a numerical answer to a problem, the number itself should be included in your submission.

NOTE: For this homework you are welcome to solve problem 1 by hand, without using programming or submitting code. However, you are **required** to solve problems 3-5 with programming, and a copy of your code must be submitted. Use of MS excel (or equivalent software) is acceptable and encouraged for problem 2; please include a copy of your final spreadsheet within your submitted PDF.

February 22 - 27 classes:

1. Consider the optimization problem:

$$\begin{aligned} \text{Maximize } & f(x,y) = -3x + y \\ \text{subject to the constraints } & x^2 + y \leq 4, \\ & -2x + y \leq 0, \\ & x \geq 0.5, \\ & y \geq 0. \end{aligned}$$

   (a) Plot the feasible solution space in the $x - y$ plane.

   (b) Solve the optimization problem by using the graphical method.

2. An aerospace company is developing a new fuel additive for commercial airliners. The additive is composed of three ingredients: X, Y, and Z. For peak performance, the total amount of additive must be at least 6 mL/L of fuel. For safety reasons, the sum of the highly flammable Y and Z ingredients must not exceed 2.5 mL/L. In addition, for the additive to work, the amount of Z must be greater than or equal to twice the amount of Y, and the amount of X must be greater than or equal to three quarters of the amount of Y. If the cost per mL for the ingredients X, Y and Z is 20 cents, 3 cents, and 5 cents, respectively, use MS excel to determine the minimum cost of the additive mixture for each liter of fuel.

March 1 - 4 classes:

3. Textbook problem 17.3
4. Textbook problem 17.15 (this problem was solved in class, here you are asked to reproduce this result on your own)
5. Textbook problem 17.17