

EECS 868: Mathematical Optimization with Applications

Spring Semester 2019

Assignment #8 Due 30 April 2019

Reading: Lecture Notes and Luenberger/Ye Sections 4.1 - 4.4, 11.1 - 11.4

1. Luenberger/Ye, Problem 8, part c (you did all other parts as part of the last assignment), p. 105. Simple Game Theory and duality.
2. Luenberger/Ye, Problem 15, p. 108, *but change* the objective function to: $5x_1 - 3x_2$. Also, "with pivot element 1" mean "with pivot element having a value of 1". Duality Theorem. In part (d), give both the values of the dual variables and the value of the dual objective function. Add part (e) as follows. *Without* calculating \mathbf{Ax} for the optimal solution, which constraints of the primal problem are active (that is, hold with equality) for the optimal solution? Justify your answer.
3. Luenberger/Ye, Problem 10, p. 71, but *change* the problem to *maximize* rather than minimize (minimizing results in a very uninteresting problem). *Note that this problem is back in chapter 3.* The solution to this problem is needed for the next problem.
4. Luenberger/Ye, Problem 11, p. 71. *Note that this problem is back in chapter 3.* and refers to a linear program that you solved in the previous problem. For parts (a) and (b), consider changes in each element of the vector *individually*, leaving other element values at their original values. Sensitivity.
5. There is an error (actually, an omission) in the LP problem statement (16) on p. 169 (max flow problem). The error can be identified by carefully comparing (16) with (15). However, note that there is a pretty obvious "typo" in (15) -- the goal is obviously to maximize the flow, not minimize it. You should simply correct this "typo" in (15) -- it is not the error/omission that is the focus of this problem.
 - a. Identify the error in (16).
 - b. Using the corrected version of (16), find its dual problem (min cut problem). Note that your answer should be slightly different from (17) on p. 174, which is the dual to the errored (16).
 - c. Identify a problem with the errored min cut problem statement (17) that is corrected by your corrected version of the min cut problem.