Linear Programming
A Term, Section A01
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Week 4: Reading and Exercises

Reading

Last week, you read Chapter 5, which is probably the most important chapter in the text. This week, I'd like you to read Chapters 6 and 7.

But Chapter 6 is similar to the handout you've already read: "Summary of the Simplex Method". So let's see what we can gain from reading the book. First, Vanderbei works through examples and examples are always valuable. Second, Vanderbei's notation differs slightly from mine. He substitutes N for $A_{\mathcal{N}}$ and I find this unnecessary (whereas the matrix $B = A_{\mathcal{B}}$ gets used a lot and gets inverted, making an abbreviation valuable). He discusses both the primal and the dual here, which is very useful, but introduces too much notation for my tastes. For example, the objective coefficients $\bar{c}_j$ in a generic dictionary are denoted instead by $-z_j^*$ with a confusing sign flip; this notation is best ignored.

Third, Vanderbei gives many formulas that we do not need. We will not be writing software in this course. While we will need to know, in matrix language, each of the decisions we make in a pivot, we will not be executing repetitive algorithms using matrices so the formulas at the top of page 92 need not be memorized.

Always read the Notes at the ends of Vanderbei's chapters. One thing we learned in Chapter 6 is that, once you know B^{-1}, you don't need to waste your time computing an entire dictionary. The revised simplex method is much closer to what real-world software does.

Chapter 7 is disappointing in two ways. First, the section on sensitivity analysis is too brief and misses some cases. So I will provide a handout to prepare you for questions on post-optimality analysis. Second, the elegant "parametric self-dual simplex method" is certainly worth reading but we won't have time to cover it in class. I'll try to include a homework or quiz question to reward you for carefully reading it, but it will not appear on the tests.

Practice Exercises

Exercises 6.1, 6.2, 6.6, and 6.7.

In Exercise 6.2, notice that, in part (i), the transpose of $z_{\mathcal{N}}^*$ is the negative of our

$$c_{\mathcal{N}}^\top - c_{\mathcal{B}}^\top B^{-1} A_{\mathcal{N}}$$

Exercises 7.1 and 7.2.