MATH 337

Linear Programs

Course instructor: Dr. Scott Greenhalgh
Email: scott.greenhalgh@queensu.ca
Office: Jeff 516

Course website: http://www.mast.queensu.ca/~math337/index.shtml
The Simplex Algorithm

Setup:
- Start with initial feasible solution
- Write obj fun as constraint $z - \text{obj fun} = 0$
- Write LP in canonical form (as a max prob)

Rule 1:
- If all $x_i$'s in $z$-constraint are non-negative STOP
  - You are at an optimal soln
  - Select an $x_i$ in $z$-constraint with negative coefficient

Rule 2
- Always ‘pivot’ in the row that has the smallest ratio of ‘entering’ variable and RHS value
- Use ‘pivot’ to remove $x_i$ from all other rows

Note: if an $x_i$ doesn’t appear in the $z$-constraint, it is referred to as a basic variable.

if an $x_i$ does appear in the $z$-constraint, it is referred to as a non-basic variable.
Sensitivity analysis: setup

\[
\max c_B x_B + c_N x_N
\]

s.t.

\[
B x_B + N x_N = b, \quad x \geq 0
\]

Basic variables:

\[
B^{-1} b
\]

Shadow prices:

\[
c_B B^{-1}
\]

Reduced costs:

\[
c_N - c_B B^{-1} N
\]
Sensitivity analysis
(post-optimality analysis)

What are the effects of changes in obj fun on the optimal solution?

What are the effects of changes in the constraints?