

Homework 2

Kent Andersen

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1

Consider the linear program (P)

$$\begin{aligned} & \text{Minimize } Z = 60x_1 + 10x_2 + 20x_3 \\ & \text{subject to} \\ & 3x_1 + x_2 + x_3 \geq 2 \\ & x_1 - x_2 + x_3 \geq -1 \\ & x_1 + 2x_2 - x_3 \geq 1 \\ & x_1 \geq 0, x_2 \geq 0, x_3 \geq 0. \end{aligned}$$

- (i) Identify a dual feasible basis.
- (ii) Solve the problem with the dual simplex method.
- (iii) Perform a sensitivity analysis by analyzing changes in the right hand sides, the objective function and the coefficients on the nonbasic variables.

2

Consider the transportation problem (P) with the following data.

	1	2	3	4	5	Supply
1	61	72	45	55	66	15
2	69	78	60	49	56	20
3	59	66	63	61	47	15
Demand	11	12	9	10	8	

Table 1:

We here have 5 destinations and 3 sources. The cost of transporting 1 unit from source 2 to destination 3 is, for instance, $c_{2,3} = 60$.

- (a) Formulate the transportation problem for this data, and its dual (D).
- (b) Construct a basic feasible solution for this transportation problem.
- (c) Make a drawing of the edges corresponding to basic variables.
- (d) Compute the corresponding dual solution, and the reduced costs.
- (f) Is the solution optimal? If not, identify a non-basic variable with negative reduced cost.

- (g) If not, identify a nonbasic variable with negative reduced cost. Identify the cycle created by adding the edge to the graph in (c), and perform a pivot.
- (h) Solve the problem with the transportation algorithm.