

DISKRETNO MODELIRANJE

VAJE 08. 03. 2018

1. Rešite naloge s prejšnjih vaj še z uporabo Reševalnika (Solver) v Excelu.
2. Za naloge s prejšnjih vaj zapišite dualni linearni program in ga rešite (s poljubnim orodjem). Primerjajte dobljeno rešitev z rešitvijo izvirnega linearnega programa.
3. Želimo maksimizirati $2x - 3y$ pri pogojih $x, y \geq 0$ in $A \begin{bmatrix} x \\ y \end{bmatrix} \geq b$, kjer

$$A = \begin{bmatrix} -1 & 1 \\ -1 & -2 \end{bmatrix} \quad \text{in} \quad b = \begin{bmatrix} 1 \\ 4 \end{bmatrix}.$$

Kakšne rešitve ima ta problem, kakšne njegov dualni?

4. Naj bo

$$A = \begin{bmatrix} 1 & -2 & 1 \\ 3 & -5 & 0 \\ 0 & 1 & -3 \end{bmatrix} \quad \text{in} \quad b = \begin{bmatrix} 5 \\ 14 \\ -1 \end{bmatrix}.$$

Poiščite $x, y, z \geq 0$, ki zadoščajo $A \begin{bmatrix} x & y & z \end{bmatrix}^T \geq b$ in ki:

- (a) maksimizirajo $-x + y - 2z$,
 - (b) minimizirajo $2x + 3y - z$,
 - (c) poskušajo zadostiti obema prejšnjima pogojema v enaki meri.
5. (vzeto iz knjige Dinh *The Luc, Multiobjective Linear Programming*)
A multiobjective version of the diet problem in hospital consists of finding a combination of foods for a patient to minimize simultaneously the cost of the menu and the number of calories under certain nutritional requirements prescribed by a treating physician. Assume a menu is composed of three main types of foods: meat with potatoes, fish with rice and vegetables. The nutrition facts, calories in foods and price per servings are given below.

	Fats	Carbohydrates	Vitamin	Calories	Prices/serving
Meat + potatoes	0.2	0.2	0.06	400	1.5
Fish + rice	0.1	0.2	0.08	300	1.5
Vegetables	0	0.05	0.8	50	0.8

Using three variables: x = number of servings of meat, y = number of servings of fish and z = number of servings of vegetables, formulate a bi-objective linear problem whose objective functions are the cost and the number of calories of the menu while maintaining the physician's prescription of at least one unit and at most one and half unit for each nutritional substance. Discuss the menus that minimize the cost and the number of calories separately.