

Exercises #5

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These exercises are intended to reinforce the lecture material. Sample solutions will be handed out on April 16th. It is recommended that you consider the problems on your own before reading the sample solutions.

1. Exercise 26.5–4, page 760 (second edition, page 691).
2. Exercise 26.5–5, page 760 (second edition, page 691).
3. Problem 26–5, page 762 (second edition, page 694).
4. Problem 29–2, parts (b) and (c), page 894 (second edition, page 819).
5. This question is related to Farkas’s lemma.
 - (a) Consider an LP of the following form: maximize $c^\top x$ subject to $Ax \leq b$ and $x \geq 0$. As stated in class, the dual of this LP is of the form: minimize $y^\top b$ subject to $A^\top y \geq c$ and $y \geq 0$. Let P denote the following LP: maximize $c^\top x$ subject to $Ax \leq 0$ and x arbitrary. By rewriting P in the form discussed in the lecture, prove that the following LP, call it D , is the dual of P : minimize 0 subject to $A^\top y = c$ and $y \geq 0$. Hint: An unconstrained variable x_i (i.e., a variable that may be positive, negative, or zero) may be modeled as the difference between two nonnegative variables x'_i and x''_i .
 - (b) Problem 29–4, page 895 (second edition, page 819).