

Homework 2—Due February 28, 2008

1. Do questions 4.2, 4.3, 4.4, 4.7, 4.8, 4.9 and 4.16 from the handout.
2. Consider the following linear programming problem:

$$\begin{aligned} \max_{x_1, x_2} \quad & \alpha x_1 + 2x_2 \quad \text{subject to} \\ & x_1 + 2x_2 \leq \beta, \\ & 2x_1 + x_2 \leq 5, \\ & x_1, x_2 \geq 0, \end{aligned}$$

where α and β are real numbers. Suppose that $\alpha = 3$ is fixed.

- Completely classify the optimal solutions x^* of this linear program as well as the value of the problem in terms of the range of possible values β could take.
- Find the dual problem associated with the primal above and completely classify the optimal solutions y^* of the dual as well as the value of the problem in terms of the range of possible values β could take.
- Plot the value of the primal, $V(\beta)$, as a function of β . Compare the slopes of β with the dual solutions you found previously.
- Now suppose that $\beta = 4$ is fixed and repeat the previous exercises by varying α instead. How does the slope of $V(\alpha)$, the value of the primal as a function of α , vary with the primal solutions?