

# 620-361 Operations Research Techniques and Algorithms

## Practice Class 8

1. Write down the Wolfe dual of:

$$\begin{array}{ll} \min_{x \in \mathbb{R}^2} & x_1 - x_2 + x_2^2 \\ \text{s.t.} & x \geq 0 \\ & \frac{x_1^2}{4} + x_2^2 \leq 1 \end{array}$$

Reduce the number of variables of the dual problem. [Hint: Eliminate the vector of multipliers corresponding to  $x \geq 0$ .]

2. Write down the Wolfe dual of:

$$\begin{array}{ll} \min & f(x) \\ \text{s.t.} & x \geq 0 \\ & Ax = b \end{array}$$

where  $f$  is smooth and  $A \in \mathbb{R}^{m \times n}$ ,  $b \in \mathbb{R}^m$ . Simplify the dual problem by eliminating the vector of multipliers corresponding to  $x \geq 0$ , to obtain a nonlinear dual problem with linear constraints.