

ENCE 724/BMGT 832  
Nonlinear Programming  
Spring 2005  
Dr. Gabriel

**Homework #5**

Given out: February 24, 2005

Due at start of class: March 3, 2005

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Note:

Homeworks will be collected at the start of the class and each week several students will be selected to present their homeworks to the class during the first 15 minutes. Five minutes (or less) will be devoted for each question.

**Reading:**

Chapter 4 in course text (Fritz John and KKT conditions)

Section: 4.1

Section 4.2 pp. 145-156

Section 4.3: pp.158-167

**Text Problems:**

4.6 a and c, also use MATLAB to solve this problem supplying your MATLAB code and output.

**Moreau's Decomposition Theorem** Recall that this theorem states the following:

Let  $K$  be a closed, convex cone in  $R^n$ . Then, for any  $z \in R^n$ , there exists an  $\bar{x} \in K, \bar{y} \in K^\circ$  such that  $z = \bar{x} + \bar{y}$  and this decomposition is unique.

**Moreau's Decomposition Theorem-1**

Let  $K = R^n$ . Show that  $K$  is a closed, convex cone. What is the polar of  $K$  in this case? Support your answer with appropriate calculations.

**Moreau's Decomposition Theorem-2**

Let  $K$  be the row space of a given  $n \times n$  matrix  $A$ . Show that  $K$  is a closed, convex cone. What is the polar of  $K$  in this case? Support your answer with appropriate calculations.