

## Five Gold Button Math Competition

December 2011

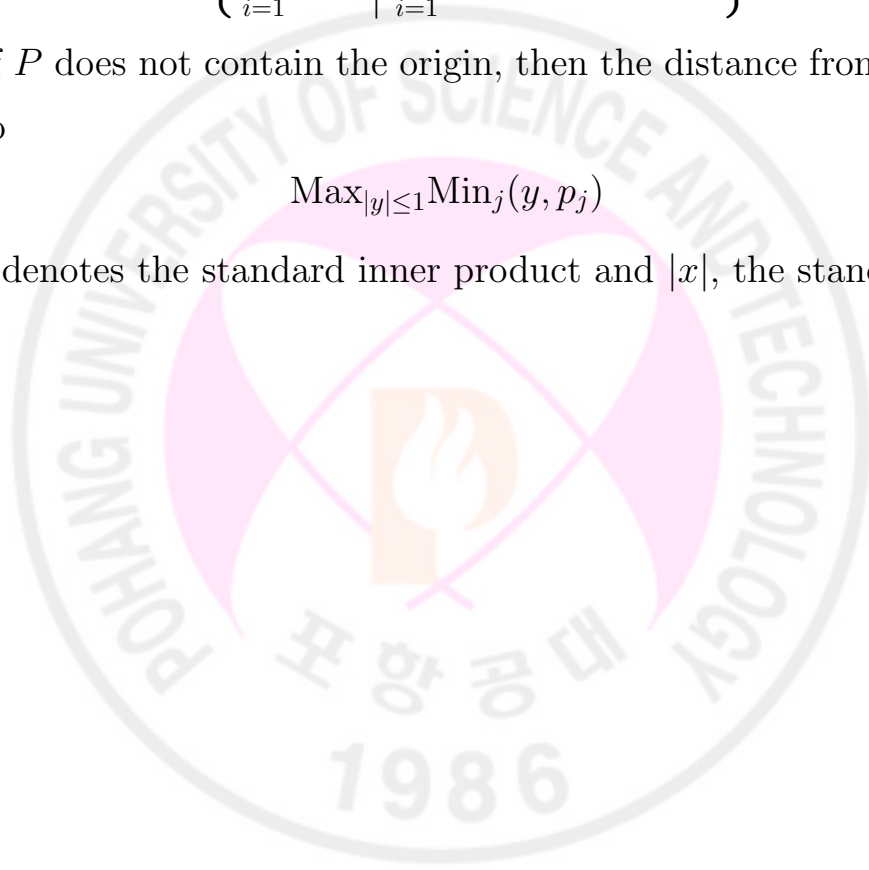
Let  $S = \{p_1, \dots, p_m\}$  be a finite set of vectors in  $\mathbb{R}^n$  and define

$$P = \left\{ \sum_{i=1}^m a_i p_i \mid \sum_{i=1}^m a_i = 1, a_i \geq 0, \forall i \right\}.$$

Prove that if  $P$  does not contain the origin, then the distance from the origin to  $P$  is equal to

$$\text{Max}_{|y| \leq 1} \text{Min}_j (y, p_j)$$

where  $(x, y)$  denotes the standard inner product and  $|x|$ , the standard length.



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