Math 421/510 Quiz 4 Solution

Name: **SID #:**

1. Consider the convex set
$$K = \{(x, y) : |x + y| \le 1, \ |x - y| \le 1\} \subseteq \mathbb{R}^2.$$

Find $p_K(x, y)$, the Minkowski functional of K.

Solution. We observe that K is the closed unit ball in the ℓ^1 norm, i.e.,
$$K = \{(x, y) : ||(x, y)||_1 \le 1\}, \quad \text{where}$$
$$||(x, y)||_1 = \max(|x + y|, |x - y|) = |x| + |y|.$$

By a result discussed in class,
$$p_K(x, y) = ||(x, y)||_1 = |x| + |y|.$$

$\square$