CS 726 - Fall 2020

Homework #1

Due : 09/21/2020, 5pm

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Question 1

Proof. When $\boldsymbol{x} = (1, 0, 0, \cdots, 0)$,

$$||x||_q = \left(\sum_{i=1}^{n} |x_i|^q\right)^{\frac{1}{q}} = 1$$

$$||x||_p = \left(\sum_{i=1}^{n} |x_i|^p\right)^{\frac{1}{p}} = 1$$

$$||x||_q = ||x||_p$$

When $\boldsymbol{x} = (1, 1, 1, \cdots, 1)$,

$$||x||_p = \left(\sum_{i=1}^{n} |x_i|^p\right)^{\frac{1}{p}} = d^{\frac{1}{p}}$$

$$d^{\frac{1}{p}-\frac{1}{q}}||x||_q = d^{\frac{1}{p}-\frac{1}{q}}\left(\sum_{i=1}^{n} |x_i|^q\right)^{\frac{1}{q}} = d^{\frac{1}{p}}$$

$$||x||_p = d^{\frac{1}{p}-\frac{1}{q}}||x||_q$$

□

Question 2

Proof. □