

A GEOMETRICAL PROOF OF THE REARRANGEMENT INEQUALITY VIA INNER PRODUCT

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For every choice of real numbers $x_1 \leq \cdots \leq x_n, y_1 \leq \cdots \leq y_n$ and every permutation $x_{\sigma_1}, \cdots, x_{\sigma_n}$ of x_1, \cdots, x_n , the rearrangement inequality states that

$$x_n y_1 + \cdots + x_1 y_n \leq x_{\sigma_1} y_1 + \cdots + x_{\sigma_n} y_n,$$

the equality holds if and only if $\sigma_1 = n, \cdots, \sigma_n = 1$. And

$$x_{\sigma_1} y_1 + \cdots + x_{\sigma_n} y_n \leq x_1 y_1 + \cdots + x_n y_n,$$

the equality holds if and only if $\sigma_1 = 1, \cdots, \sigma_n$.

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