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On Rectangular Constant in Normed Linear Spaces

We study the properties of rectangular constant $\mu(\mathbb{X})$ in a normed linear space $\mathbb{X}$. We prove that $\mu(\mathbb{X}) = 3$ if and only if the unit sphere contains a straight line segment of length 2. In fact, we prove that the rectangular modulus attains its upper bound if and only if the unit sphere contains a straight line segment of length 2. We prove that if the dimension of the space $\mathbb{X}$ is finite then $\mu(\mathbb{X})$ is attained. We also find a necessary and sufficient condition for a normed linear space to be an inner product space in terms of conditions involving rectangular constant.

Keywords: Birkhoff-James Orthogonality, rectangular constant.

MSC: 46B20; 47A30