

RIESZ POTENTIAL ESTIMATES AND OPTIMAL SOBOLEV INEQUALITIES FOR CANCELING OPERATORS

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Inequalities for Riesz potentials are well-known to be equivalent to Sobolev inequalities of the same order for domain norms "far" from L^1 , but to be weaker otherwise. Recent contributions by Van Schaftingen, by Hernandez, Raita and Spector, and by Stolyarov have demonstrated that this gap can be filled in Riesz potential inequalities for vector-valued functions in L^1 fulfilling a co-canceling differential condition. It will be shown that this property is not just peculiar to the space L^1 . Indeed, under the same differential constraint, a Riesz potential inequality is shown to hold for any domain and target rearrangement-invariant norms that render a Sobolev inequality of the same order true. This is based on an interpolation argument enabling us to prove a parallel Sobolev inequality for canceling homogeneous differential operator. Our result shows that Sobolev inequalities involving first or higher order standards gradient share the same rearrangement-invariant domain and target spaces as their analogs for any other canceling homogeneous differential operator. As an outcome, Riesz potential inequalities under the co-canceling constraint and Sobolev inequalities for canceling operators are offered for general families of rearrangement-invariant spaces, such as the Orlicz spaces and the Lorentz-Zygmund spaces. This is joint work with D.Breit and D.Spector.