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A Rigorous Investigation on the Ground State of the Penson-Kolb Model

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Abstract: By using either numerical calculations or analytical methods, such as the bosonization technique, the ground state of the Penson-Kolb model has been previously studied by several groups. Some physicists argued that, as far as the existence of superconductivity in this model is concerned, it is canonically equivalent to the negative-U Hubbard model. However, others did not agree. In the present paper, we shall investigate this model by an independent and rigorous approach. We show that the ground state of the Penson-Kolb model is nondegenerate and has a nonvanishing overlap with the ground state of the negative-U Hubbard model. Furthermore, we also show that the ground states of both the models have the same good quantum numbers and may have superconducting long-range order at the same momentum q=0. Our results support the equivalence between these models.

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