Approximation Theorem for Graph Functions

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Graph function analysis is an emerging field attracting more and more attention. In this paper, we extend several basic concepts and results in classical approximation theory to the framework of graph function analysis. We study the approximation of a graph function by functions in the Paley-Wiener space, which is defined by using the graph Fourier basis. First, we define translation operators and moduli of smoothness on graphs, which have many good properties similar to their counterparts in classical approximation theory. Next, we establish Jackson's and Bernstein's inequalities for graph functions, and prove the equivalence between the decay rate of the approximation error and the smoothness of the graph function. Finally, we prove the decay rate of the graph Fourier coefficients.