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The probabilistic analysis of information ranking algorithms such as Google's PageRank naturally leads to an approximation in terms of the solution to a linear nonhomogeneous fixed-point equation on a weighted branching tree. Using an appropriate random graph model we show how the tree approximation is justified and therefore the analysis of linear algorithms on certain types of graphs is equivalent to the analysis of a related fixed-point equation. We also mention some of the recent results that describe the asymptotic behavior of the solutions to such equations. (Received September 24, 2012)