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Spectral Radius and Infinity Norm of Matrices.

Let $M_n(R)$ be the linear space of all $n \times n$ matrices over the real field R . For any $A \in M_n(R)$, let $\rho(A)$ and $\|A\|_\infty$ denote the spectral radius and the infinity norm of A , respectively. By introducing a class of transformations φ_a on $M_n(R)$, we show that, for any $A \in M_n(R)$, $\rho(A) < \|A\|_\infty$ if $\varphi_{\|A\|_\infty}^n(A) = 0$. If $A \in M_n(R)$ is nonnegative, we prove that $\rho(A) < \|A\|_\infty$ if and only if $\varphi_{\|A\|_\infty}^n(A) = 0$, and $\rho(A) = \|A\|_\infty$ if and only if the transformation $\varphi_{\|A\|_\infty}$ preserves the spectral radius and the infinity norm of A . As an application, we investigate a class of linear discrete dynamic systems in the form of $X(k+1) = AX(k)$. The asymptotical stability of the zero solution of the system is established by a simple algebraic method. (Received September 06, 2007)