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*On some classes of nonlinear equations in Hilbert spaces arising from the spectral theory*

Let $L(\alpha)$ be an operator function of the class $C^1\big([a,b],S(H)\big)$ such that $L(a) \ll 0$, $L(b) \gg 0$ and for all $x \in H \setminus \{0\}$ the function $\big(L(\alpha)x,x\big)$ has exactly one zero $p(x)$ in $(a,b)$. Define the following nonlinear operator

$$Tx = \begin{cases} L\big(p(x)\big)x, & x \neq 0, \\ 0, & x = 0. \end{cases}$$

We study a connection between solvability problems for the equation $Tx = y$ and completeness problems for eigenvectors of the operator functions $L(\alpha)$. We give some sufficient conditions for completeness of eigenvectors corresponding to eigenvalues from the interval $[a,b]$ which are based on separation properties of the functional $p(x)$.