In the presented work, we study numerical methods for approximation of a function f of a matrix A. First, we give theoretical background - definitions of matrix functions, and their properties. Further, we summarize basic numerical methods for computation of an approximation of matrix functions $f(A)$. In many applications, we need to approximate the matrix function $f(A)$ applied on an apriory given vector $\boldsymbol{b}$, i.e. $f(A)\boldsymbol{b}$. Especially, when A is large and sparse, the computation of approximation to $f(A)$ and subsequent multiplication by the vector $\boldsymbol{b}$ can be computationaly expensive. Therefore we study methods, which compute the approximation of $f(A)\boldsymbol{b}$ directly. Main emphasis is placed on the polynomial approximation in the least squares sense, and several modifications of Krylov subspace methods. Numerical experiments compare convergence and computational time required to obtain reasonable approximation to $f(A)\boldsymbol{b}$.