Abstract. In this talk we review Krylov subspace methods for approximating the action of a matrix rational function $R$, namely $y = R(A)v$, where $v$ is a vector and $A$ is a large dimension matrix. Our analysis is then used to study rational approximation to the matrix exponential operator, $e^{A}v$. We also show that Krylov subspace approximations are particularly appropriate when geometric properties need be preserved, as is the case for $e^{A}v$ when $A$ is skew-symmetric and/or Hamiltonian.