below. For this demonstration, the systems are assumed to be time-invariant, and the \( \infty \)-norm is defined over an infinite time interval.

The transfer function of a time-invariant system can be related to the transfer function of the adjoint system. The transfer function of the original system is

\[
G(s) = C(sI - A)^{-1}B + D.
\]

Taking the transpose of this transfer function yields the transfer function of the adjoint system:

\[
G^T(s) = B^T(sI - A^T)^{-1}C^T + D^T = \tilde{G}(s).
\]

The infinity norm of the adjoint system is then given:

\[
\|\tilde{G}\|_{\infty} = \sup_{\omega} (\tilde{\sigma}(\tilde{G}(j\omega))) = \sup_{\omega} (\tilde{\sigma}(G^T(j\omega))) = \sup_{\omega} (\tilde{\sigma}(G(j\omega))) = \|G\|_{\infty}.
\]

The fact that the maximum singular value of a matrix equals the maximum singular value of the matrix transposed can be easily understood by noting that the nonzero singular values of a matrix \( M \) are the nonzero eigenvalues of \( MM^T \), which equal the nonzero eigenvalues of \( M^T M \).