

Concept Question 9-9: Why is the bilinear transformation of a piecewise-constant gain also piecewise constant?

The bilinear transformation warps the frequency axis using Eq. (9.98), which is $\omega = (2/T) \tan(\Omega/2)$. A piecewise constant gain changes at specific frequencies $\{\omega_i\}$. The transformed frequency response changes its gain only at frequencies $\{\Omega_i\}$ computed from $\{\omega_i\}$.