Proposed solutions FWA Aug '06

1. The respective z-transforms may be considered as polynomials in $1/z$ of degree $M-1$ and $N-1$. Their product has then degree $M+N-2$.

2. Use the scaling equation and the filter equation.

3. Use the scaling properties of the Fourier transform to show the homogeneity. For tempered distributions the property is defined via the test function in analogy with that for the function interpreted as a distribution.

4. Subtracting a suitable polynomial of degree 3 in $1/\epsilon$ with coefficients expressed in $D^j\varphi(0)$, $j = 0, 1, 2$ from

$$\int_{|x|>\epsilon} \varphi(x)/x^4 \, dx$$

and taking the limit as $\epsilon \to 0^+$, the principal value is defined. Verification of the distribution properties may then be made on the alternative expression for this limit.