Proposed solutions FWA August '07

1. Factorization of the product filter gives H, which then gives G.
2. In the definition, write $e^{-2\pi i k n/N} = e^{-2\pi i k(n-l)/N} e^{-2\pi i k l/N}$.
3. The transform may be performed independently in each variable, and multiplication by the variable corresponds to differentiation.
4. For $s > 0$, $\int_0^\infty x^{-1/2} e^{-2\pi i s x}\, dx = s^{-1/2} \int_0^\infty x^{-1/2} e^{-2\pi i x}\, dx = s^{-1/2}\, 2 \int_0^\infty e^{-2\pi i x^2}\, dx = s^{-1/2}(1-i)/2$. Thus, for $s \in R$, the transform is $|s|^{-1/2}(1 - i\,\text{sign}\,s)/2$.