

Inverse Z-transform and poles and zeros

When finding the inverse Z-transform of functions with z^{-1} terms in the numerator, the fact that z^{-1} can be thought of as a delay operator can be used to simplify the computation. Consider

$$X(z) = \frac{1 - z^{-10}}{1 - z^{-1}} = (1 - z^{-10})u[n]$$
$$\rightarrow u[n] = \frac{z}{z-1} = \frac{1}{1-z^{-1}}$$

- Use the Z-transform of $u[n]$ and the properties of the Z-transform to find $x[n]$.
- If we consider $X(z)$ a polynomial in negative powers of z , what would be its degree and the values of its coefficients?
- Find the poles and the zeros of $X(z)$ and plot them on the z -plane. Is there a pole or zero at $z = 1$? Explain.

Initial conditions and steady state