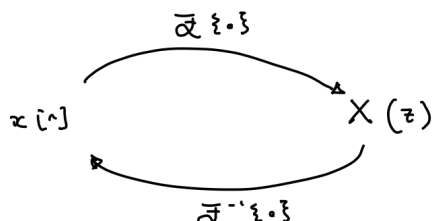
Inverse z-transform

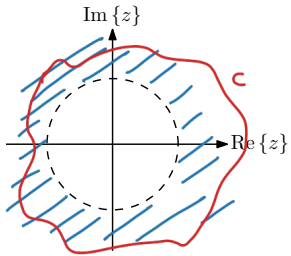
Herman Kamper



Inverse z-transform

Inverse by taking closed contour integral:

$$x[n] = \frac{1}{2\pi j} \oint_C X(z) z^{n-1} \, \mathrm{d}z$$



Inverse z-transform using known pairs:

- Write z-transform as linear combination of simple terms for which the time-domain sequences can be found in a table
- Often use partial fraction expansion to deal with rational z-transforms

Intuition: inverse using known z-transform pairs

$$X(z) = \frac{1 + 2z^{-1} + z^{-2}}{1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2}}$$

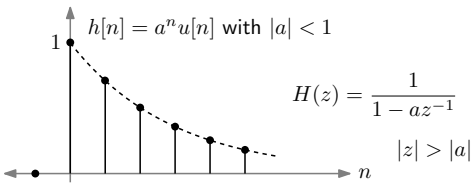
$$= 2 - \frac{9}{1 - \frac{1}{2}z^{-1}} + \frac{8}{1 - z^{-1}}$$

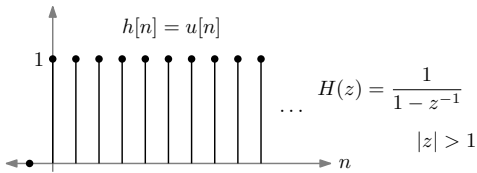
Partial fraction expansion

$\mathcal{Z}^{-1}\{\cdot\}$

$x[n] = 2\delta[n] - 9 \cdot \left(\frac{1}{2}\right)^n u[n] + 8 \cdot u[n]$

Known z-transform pairs:





Further watching and reading

Section 3.4.3 of Proakis and Manolakis (2007)

Barry Van Veen's videos on the z-transform:
https://www.youtube.com/playlist?list=PLGI7M8vwfrFNvNxfQGXntdwQ2lRSe0frf