

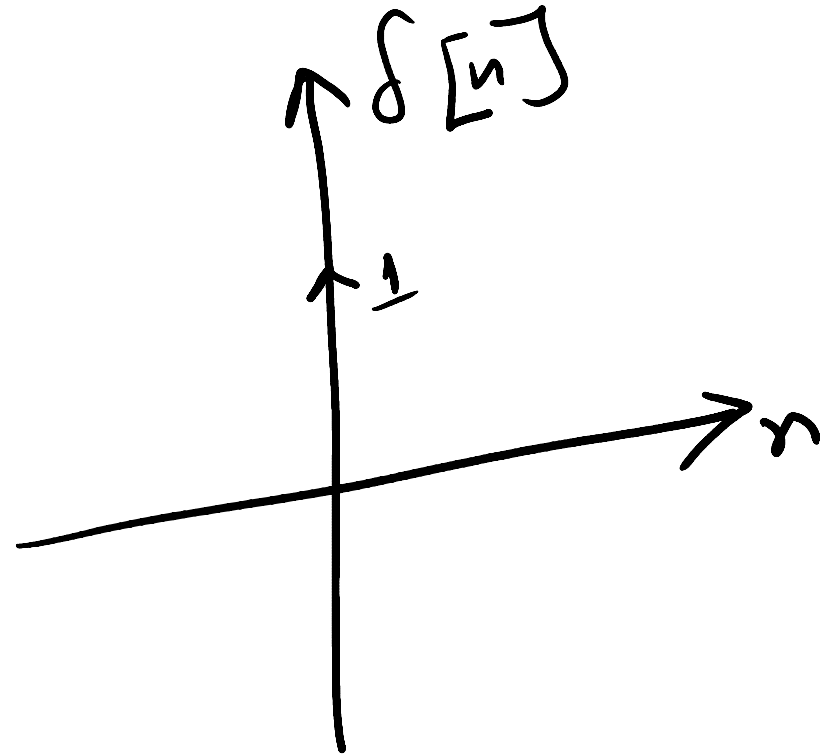
# Z-Transform

- Z-transform of  $\delta[n]$

$$X(z) = \sum_{n=-\infty}^{\infty} x(n) z^{-n}$$

$$= \delta(0) z^0 = 1.$$

Here, ROC is entire  $z$ -plane.



# Z Transform

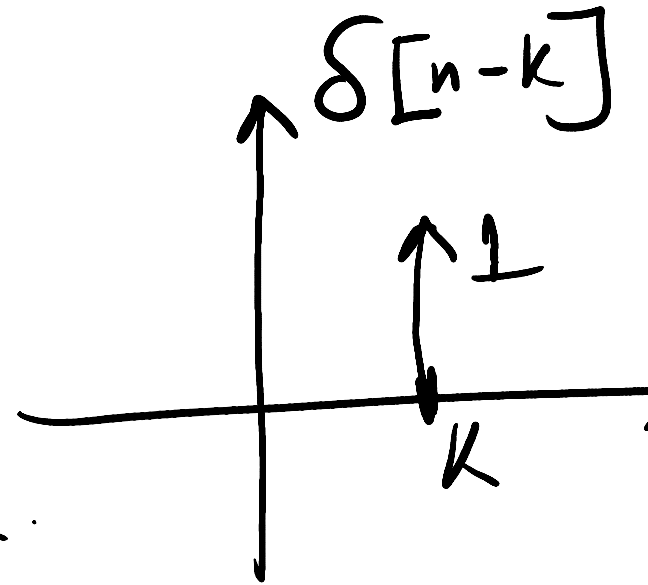
- Z transform of  $d[n-k]$

$$X(z) = \sum_{n=-\infty}^{\infty} x(n) z^{-n}$$

$$= 1 z^{-k} = z^{-k} = \left(\frac{1}{z}\right)^k.$$

$$\text{ROC: } |z| > 0; k > 0$$

$$|z| < \infty; k < 0$$



# Z Transform

- Z transform of unit step signal.

$$X(z) = \sum_{n=-\infty}^{\infty} x(n) z^{-n} = \sum_{n=0}^{\infty} u[n] z^{-n} = \sum_{n=0}^{\infty} z^{-n}$$

$$= \sum_{n=0}^{\infty} \left(\frac{1}{z}\right)^n = \frac{1}{1 - 1/z} = \frac{z}{z-1} //$$

$$\text{ROC: } |z| > 1$$