Assignment 1
EE3900: Linear Systems and Signal Processing
Indian Institute of Technology Hyderabad

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Discrete-time Signal Processing
Oppenheim and Schafer

Problem 3.10.(c) Without explicitly solving for X(z), find the region of convergence of the z-transform of each of the following sequences and determine whether the Fourier transform converges:

$$x[n] = 2^n u[-n] \qquad (1)$$

Solution:

$$x[n] = 2^n u[-n] \qquad (2)$$
$$= \{1/2\}^{-n} u[-n] \qquad (3)$$

$$x[-n] \iff X\left(\frac{1}{z}\right) \qquad (4)$$

$$\{1/2\}^n u[n] \implies \text{ROC is } |z| > \tfrac{1}{2}$$

$$\{1/2\}^{-n} u[-n] \implies \text{ROC is } |z| < 2$$