



Department of Electrical Engineering
School of Science and Engineering

EE310 Signals and Systems

TUTORIAL 10

Information:

- We use the following Fourier transform pairs:

$$\mathcal{F}\{\alpha^{|n|}\} = \frac{1 - \alpha^2}{1 - 2\alpha \cos(\omega) + \alpha^2}, \quad |\alpha| < 1$$

$$\mathcal{F}\{\alpha^n u[n]\} = \frac{1}{1 - \alpha e^{-j\omega}}, \quad |\alpha| < 1.$$

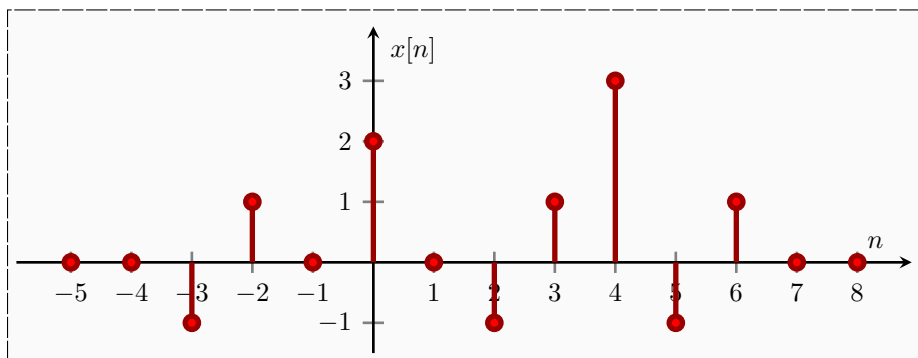
Tutorial 10-1

Using the properties of discrete-time Fourier transform or otherwise, determine the discrete-time Fourier transform of the following signals:

- (i) $x[n] = 5^n u[-n]$, (ii) $x[n] = n 3^{-|n-2|}$

Tutorial 10-2

Let $X(e^{j\omega})$ denote the Fourier transform of the signal $x[n]$ shown below.



- Evaluate $X(e^{j0})$.
- Evaluate $X(e^{j\pi})$.
- Evaluate $\int_{-\pi}^{\pi} X(e^{j\omega}) d\omega$.
- Evaluate $\int_{-\pi}^{\pi} |X(e^{j\omega})|^2 d\omega$.
- Evaluate $\int_{-\pi}^{\pi} \left| \frac{dX(e^{j\omega})}{d\omega} \right|^2 d\omega$.
- Determine and sketch the signal whose Fourier transform is $\text{Re}\{X(e^{j\omega})\}$, where $\text{Re}\{\}$ denotes the real part.

Tutorial 10-3

Problem 5.26 (Textbook)