

1st Exercise in Digital Information Processing 24/10/2011

1. Signal composition

- Give the definition of a ramp sequence.
- Rewrite the following function as a sum of weighted ramp sequences.

$$x(n) = \begin{cases} n-1 & 0 < n < 4 \\ 0 & \text{otherwise} \end{cases}$$

- Rewrite the following function values as a sum of weighted ramp sequences. Infer the resulting function and plot a graph of the function.

$$\begin{aligned} x(1) &= 0; x(2) = 1,5; x(3) = x(4) = x(5) = 3; x(6) = x(7) = 1; \\ x(n) &= 0 \text{ otherwise} \end{aligned}$$

- Rewrite the unit step sequence as sum of dirac delta sequences. Rewrite the ramp sequence as a sum of unit step sequences.
- Illustrate the dirac delta sequence graphically by using the unit step sequence.

2. Signal Properties

- The following function is given:

$$x(n) = \begin{cases} 0 & n < 0 \\ (-0.5)^n & \text{otherwise} \end{cases} .$$

Calculate these properties:

(a) the absolute sum $S_A = \sum_{n=-\infty}^{\infty} |x_n|$

(b) the discrete sum $S_D = \sum_{n=-\infty}^{\infty} x_n$

(c) and the signal energy $E = \sum_{n=-\infty}^{\infty} |x_n|^2$