Problem-Solving Session

Energy and power

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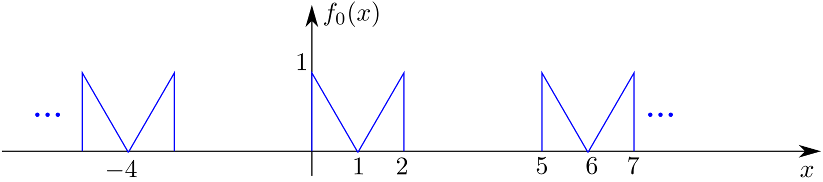
 Exercise 1: Energy and power of a signal

Exercise 1: Energy and power of a signal

Let the signal $f_0(x)$ be given as in the next figure



Determine:

a) Average value $\langle f_0(x) \rangle$

b) Average power of the signal $\langle P\left[f_0(x)\right] \rangle$

c) Energy per period $E_0\left[f_0(x)\right]$

Exercise 2: Even and odd parts

In this problem, we explore several of the properties of even and odd signals.

a) Show that if if $x(n)$ is and odd signal, then:

$$\sum_{n=-\infty}^{\infty} x(n) = 0$$

b) Show that if $x_1(n)$ is an odd signal and $x_2(n)$ is an even signal, then $x_1(n)x_2(n)$ is an odd signal.

c) Let $x(n)$ be an arbitrary signal, with even and odd parts denoted by $x_e(n)$ and $x_o(n)$. Show that:

$$\sum_{n=-\infty}^{\infty} x^2(n) = \sum_{n=-\infty}^{\infty} x_e^2(n) + \sum_{n=-\infty}^{\infty} x_o^2(n)$$

d) Although the previous parts have been stated in terms of discrete-variable signals, the analogous properties are also valid in continuous time. To demonstrate this, show that:

$$\int_{-\infty}^{\infty} f^2(x)dx = \int_{-\infty}^{\infty} f_e^2(x)dx + \int_{-\infty}^{\infty} f_o^2(x)dx$$

where $f_e(x)$ and $f_o(x)$ are the even and odd parts of $f(x)$, respectively.