(1.4)

$$x(t) = \begin{cases} 3, & -2 \le t \le 1 \\ 0, & \text{αλλού} \end{cases}$$

1) $u(t+2)$ $u(t-1)$

$\Rightarrow x(t) = 3\left(u(t+2) - u(t-1)\right)$

2) $t < -2$

$t+2 < 0 \Rightarrow u(t+2) = 0$

$t-1 < 0 \Rightarrow u(t-1) = 0$

$\Rightarrow x(t) = 3(0-0) = 0$

- $-2 \le t < 1 \Rightarrow$

  $t+2 \ge 0 \Rightarrow u(t+2) = 1$

- $t-1 < 0 \Rightarrow u(t-1) = 0$

  $\Rightarrow x(t) = 3(1-0) = 3$

- $t \ge 1$

  $t+2 \ge 0 \Rightarrow u(t+2) = 1$

  $t-1 \ge 0 \Rightarrow u(t-1) = 1$

  $\Rightarrow x(t) = 3(1-1) = 0.$

(1.8)

$$x[n] = \begin{cases} n, & 0 \le n \le 5 \\ 0, & \text{αλλού} \end{cases} \qquad n=6$$

1. $u[n] - u[n-6]$

$x[n] = n\left(u[n] - u[n-6]\right)$

2.

$$E = \sum_{n=-\infty}^{\infty} |x[n]|^2 =$$

$$= \sum_{n=0}^{5} |n|^2 = \sum_{n=0}^{5} n^2$$

$$\sum_{n=0}^{5} n^2 = 0^2 + 1^2 + 2^2 + 3^2 + 4^2 + 5^2$$

$$= 0 + 1 + 4 + 9 + 16 + 25$$

$E = 55$

(1.11) $x(t) = \cos(4\pi t) + \cos(6\pi t)$

1. $\cos(4\pi t) = \cos(2 \cdot 2\pi t) \Rightarrow$

$T_1 = \frac{1}{2}$

$\cos(6\pi t) = \cos(2\pi \cdot 3t)$

$T_2 = \frac{1}{3}$

2. $\frac{T_1}{T_2} = \frac{1/2}{1/3} = \frac{3}{2} \in \mathbb{Q}.$

$\Rightarrow x(t)$: περιοδικό

αφού $\frac{T_1}{T_2}$: ρητός

3. ΕΚΠ(T_1, T_2)

$\Rightarrow T = mT_1 = nT_2$

$\Rightarrow T = \frac{m}{2} = \frac{n}{3} \Rightarrow 3m = 2n$

$m=2, n=3$

$\Rightarrow T = \frac{3}{2} = 1$ $\quad T = \frac{m}{2} = \frac{2}{2} = 1$

(1.16) $x(t) = e^t u(-t)$

$$x(t) = \begin{cases} e^t, & t \le 0 \\ 0, & t > 0 \end{cases}$$

$$x(t) = \begin{cases} e^t, & t \le 0 \\ 0, & t > 0 \end{cases}$$

2

(1.17) $x(t) = e^{-t} u(t) + e^t u(-t)$

$t \ge 0$, $u(t) = 1$

$u(-t) = 0$

$x(t) = e^{-t}, \quad t \ge 0$

$t < 0$, $u(t) = 0$

$u(-t) = 1$

$x(t) = e^t, \quad t < 0$

$$x(t) = \begin{cases} e^t, & t \le 0 \\ e^{-t}, & t \ge 0 \end{cases}$$

x : άπειρο

(αμφίπλευρο)

(1.30) $x(t) = \begin{cases} 2, & |t| \le 1 \\ 0, & \text{διαφορετικά} \end{cases}$

$E = ?, \quad P = ?$

1) $E = \int_{-\infty}^{\infty} |x(t)|^2 dt$

$= \int_{-1}^{1} 2^2 dt = \int_{-1}^{1} 4\, dt$

$= 4 \cdot [x]_{-1}^{1} = 4\left(1 - (-1)\right)$

$= 4 \cdot 2 = 8$

$E = 8$

2) $P = \lim_{T \to \infty} \frac{1}{2T} \int_{-T}^{T} |x(t)|^2 dt$

$\int_{-T}^{T} |x(t)|^2 dt = \int_{-1}^{1} 4\, dt = 8$

$P = \lim_{T \to \infty} \frac{1}{2T} \cdot 8 = \lim_{T \to \infty} \frac{4}{T} = 0$

$P = 0 \Rightarrow x(t)$: έχει πεπερασμένη ενέργεια.