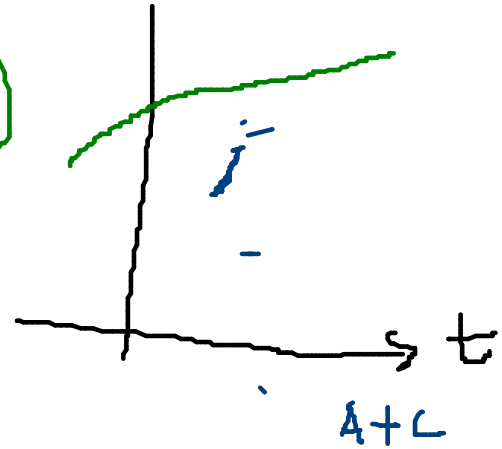
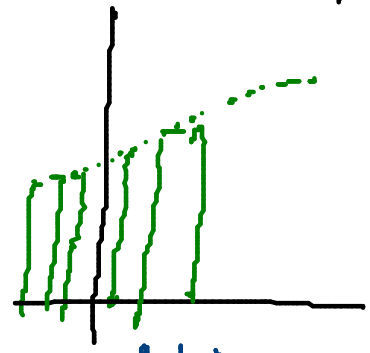
25/7/17

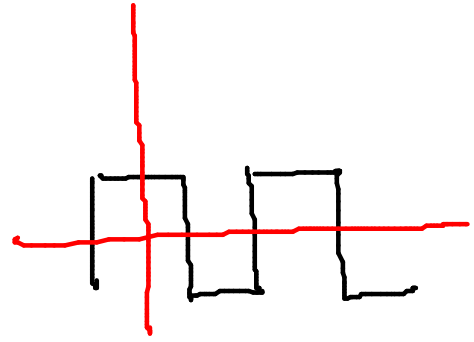
$x(a, b, c \ldots)$



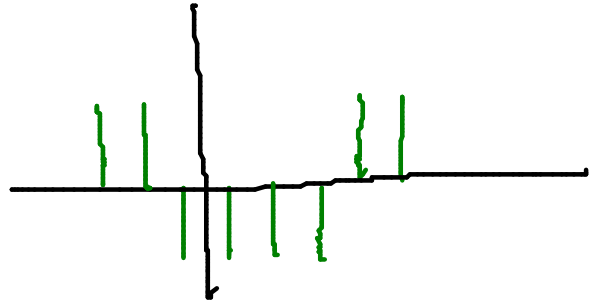


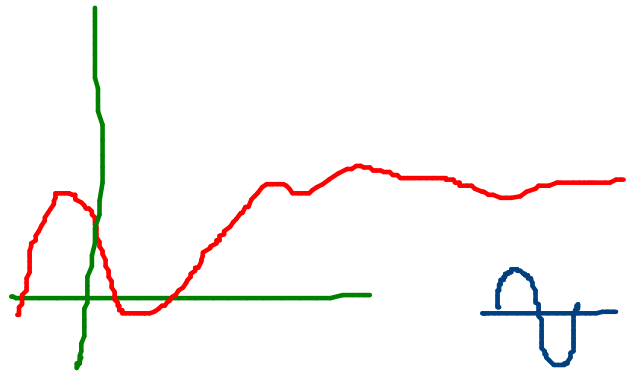
Signal

- Independent
  - CT
  - DT
- Dependent variable
  - Analog
  - Digital



Dig. CT





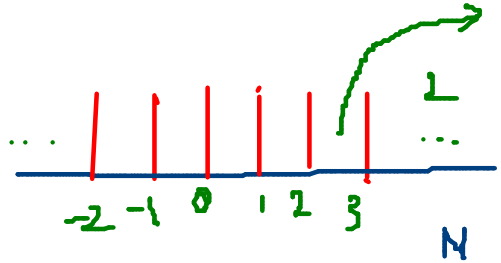
$$\int_{-\infty}^{\infty} x(t)\,dt$$

$$|x(t)|^2$$

$$\lim_{T\to\infty} \int_{-T}^{T} |x(t)|^2\,dt$$

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

e.g. $x[n] = 2 \quad \forall\, n$



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

$$= \lim_{N\to\infty} \sum_{n=-N}^{N} 4 = \lim_{N\to\infty} 4(2N+1)$$

$$= \infty$$

$$P = 4 < \infty$$

$$P = \lim_{N\to\infty} \frac{1}{2N+1} \sum_{n=-N}^{N} |x[n]|^2$$

$$= \lim_{N\to\infty} \frac{1}{2N+1} \{2N+1\}$$

$$= 1 \quad < \infty$$

Eg $\quad x(t) = 1 \; ; \quad 0 \le t \le 1$

$$= 0 \; ; \text{ Otherwise}$$

$$E = \lim_{T\to\infty} \int_{-T}^{T} |x(t)|^2 dt = \lim_{T\to\infty} \int_{0}^{T} |1|^2 dt = \lim_{T\to\infty} \int_{0}^{1} dt$$

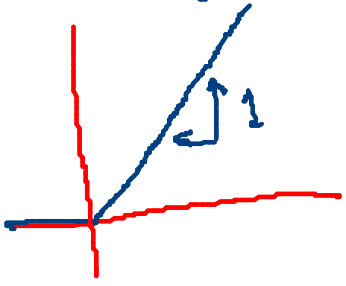
$$= 1$$

$$P = 0$$

e.g

$x(t) = t \;;\; t \geq 0$

$= 0 \;;$ otherwise



	E	P
Power signals	∞	Finite
Energy Signals.	Finite	0
Neither Energy Nor power.	∞	∞

e.g: $x(t) = A\cos(\omega t)$

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

$$= \lim_{T\to\infty} \int_{-T}^{T} A^2 \cos^2(\omega t)\, dt$$

$$= \frac{A^2}{2} \lim_{T\to\infty} \int_{-T}^{T} \left[1 + \cos(2\omega t)\right] dt$$

$$= \frac{A^2}{2} \lim_{T\to\infty} \left[2T + \frac{1}{2\omega}\sin(2\omega T)\right]$$

$= \infty$

Power

e.g $x[n] = \left(\frac{1}{2}\right)^n \; ; \; n \geq 0$

$E = \frac{4}{3} < \infty$

$P = 0$

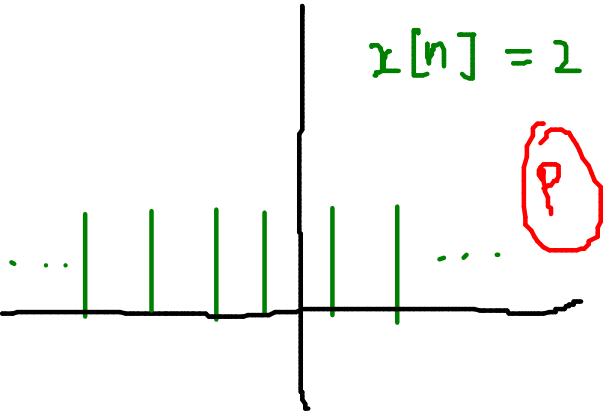
Energy

$|\sin(\cdot)| = 0$ to 1

$P = \frac{A^2}{2} < \infty$

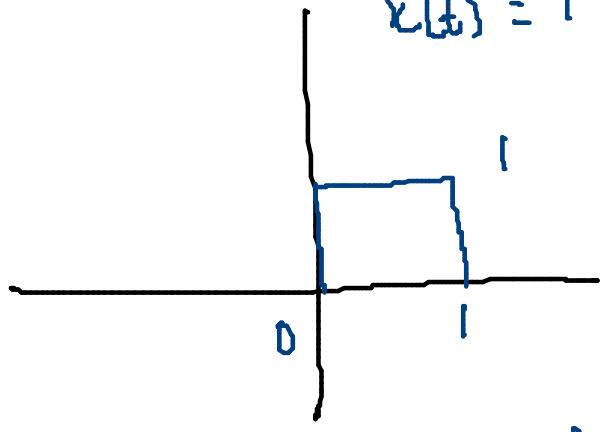
$x[n] = 2$

P



$x(t) = 1 \; ; \; 0 \leq t \leq 1$

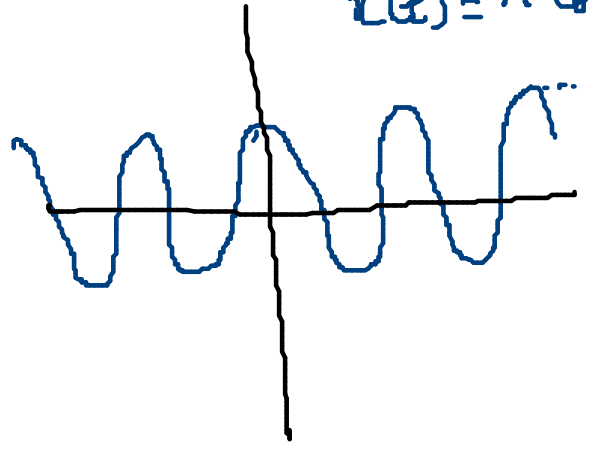
E



NE
NP

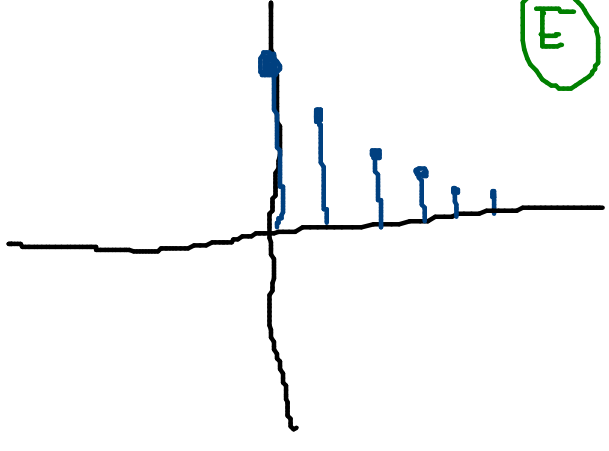
$x(t) = t \; ; \; t \geq 0$

$x(t) = A \cos(\omega t)$



P

E



e.g.: $x[n] = 2e^{j3n} \quad \forall n$

Books :-

1. "Signals and Systems" Oppenheim, Schafer, Hamid (Pearson)
2. "Linear Systems & Signals" B.P. Lathi ; (OUP)

Video Lectures

1. "Signals & Systems" by Prof. Vikram Gadre, edX IITB
2. —"— Dutta Roy, IITD (YT)
3. —"— Alan Oppenheim MIT OCW

Software

1. Matlab
2. Scilab / Octave