A <u>time-series</u> is a sequence of r.v.'s x_1, x_2, x_3 where x_t indicates the value taken by the sequence at time t.

<u>White noise</u>: $\{w_t\}$ where $w_t \sim wn(0, \sigma_w^2)$ is uncorrelated with mean 0 & variance σ_w^2

<u>white independent noise</u> means the w_t are independent

<u>Gaussian white noise</u> is where the w_t are all $N(0, \sigma_w^2)$.

Gaussian implies independent WN process, since

X & Y are uncorrelated if

$$E[(X-\mu_x)(Y-\mu_y)] = 0$$

$$\text{cov}(X,Y) = 0$$

X & Y are <u>independent</u> if

Let A & B be sets

$$P(X \in A \text{ and } Y \in B) = P(X \in A) \cdot P(Y \in B)$$

<u>Exercise</u> 1: generate a realization from a Gaussian white noise process with $\sigma_w^2 = 1$. Plot it.

Eg Moving averages & filtering.

Example:

let $w_t \sim GWN(0,1)$ $\quad t = 1, \cdots 100$

let $v_t = \frac{1}{3}(w_{t-1} + w_t + w_{t+1})$ $\quad t = 2 \cdots 99$

In general,

Eg $v_t = \beta_{t-k} w_{t-k} + \beta_{t-k+1} w_{t-k+1} \cdots +$

$\beta_{t+k-1} w_{t+k-1} + \beta_{t+k} w_{t+k}$

$$= \sum_{s=t-k}^{t+k} \beta_s w_s$$

one sided means $\beta_{t-k} = \cdots = \beta_{t-1} = 0$ or

$\beta_{t+1} = \cdots = \beta_{t+k} = 0$