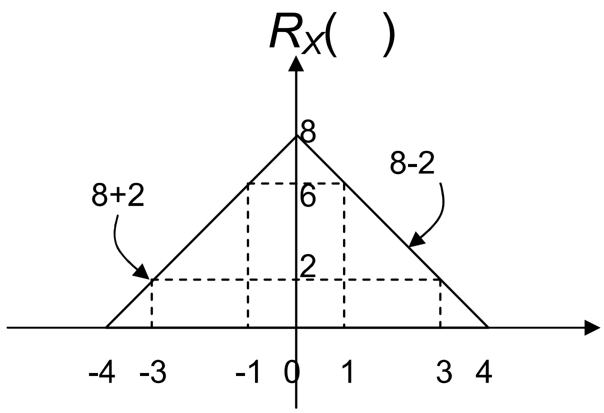
1. Suppose a random process X(t) is Gaussian WSS with a mean of zero and an autocorrelation function given by



Let the process be sampled at t = 2 and t = 5.

Suppose the samples are used to form the optimum linear mean squared error prediction of X(t) at time t = 6. Give the complete expression for the estimate of X(6).

2. Define a independent sequence of random variables such that X_n is uniformly distributed over the union of intervals $\left[-1, -\frac{n}{n+1}\right] \cup \left[\frac{n}{n+1}, 1\right]$.
Determine whether or not this sequence converges in probability. Explain.

3. Let A_n be an iid sequence such that $P(A_n = 3) = P(A_n = 1) = 1/2$ for each n. Let the sequence $\{t_1, t_2, \cdots\}$ be Poisson points (i.e. times of occurrences) with average rate λ. Finally, let $Y(t)$ be a random process such that $Y(0) = 0$ and $Y(t) = \sum_{n=1}^{+\infty} A_n u(t - t_n)$, where $u(t)$ is the unit step function. In words, Y(t) changes only in steps, adding the value of A_n at the nth occurrence time.
Give
(a) the mean of Y(t) (Hint: consider iterated expectation)
(b) the autocorrelation function for Y(t).