1. Suppose you are told that a random process $Y_n$ converges to a random variable $Y$ with probability one.
   a) Does it converge in distribution? $\text{Yes}$.
   
   b) Does it converge in mean square? $\text{No}$.
   
   c) Does it converge in probability? $\text{Yes}$.

2. Suppose I have the following random process $\{X_t; t \in Z\}$
   Additionally suppose that the mean can be represented by
   $EX_t = EX_{t+\tau} = 2$
   Additionally suppose that I have the following covariance matrix:
   $K_X(\tau) = \begin{bmatrix}
   2 & 1 & 0.5 & 0 & 0 \\
   1 & 2 & 1 & 0.5 & 0 \\
   0.5 & 1 & 2 & 1 & 0.5 \\
   0 & 0.5 & 1 & 2 & 1 \\
   0 & 0 & 0.5 & 1 & 2
   \end{bmatrix}$
   Given the information above about this process,
   a) Is it first-order stationary? $\text{No}$.
   
   b) Is it weakly stationary? $\text{Yes}$.
   
   c) Is it second-order stationary? $\text{No}$.
   
   d) Is it strictly stationary? $\text{No}$.

3. Suppose I have a weakly stationary asymptotically uncorrelated discrete time process, $\{X_n\}$ such that $EX_n = X$ is finite and $\sigma_{X_n}^2 = \sigma_X^2 < \infty$ for all $n$. What can I say about the convergence of the sample average of this process?

   The sample average converges to the mean in mean square.

   $\lim_{n \to \infty} \frac{1}{n} \sum_{i=0}^{n-1} X_i = \overline{X}$.