

1. For a stable LTI system, if the input $X(t)$ is a WSS process, is the output $Y(t)$ also a WSS process? Why?
(hint : Let the impulse response of the LTI system is $h(t)$, and **prove it.**)

2. Let $Y(t) = X(t) \cos(2\pi f_c t + \Theta)$, $X(t)$ is a stationary process, and the phase Θ is a random variable that is uniformly distributed over the interval $[0, 2\pi]$. Please derive **the autocorrelation function** $R_Y(\tau)$ and **the power spectral density** $S_Y(f)$ of the random process $Y(t)$.
(hint : You can find this problem in page 49 of the text book.)

3. The power spectral density of a random process $X(t)$ is shown in Figure 1. It consists of a delta function at $f = 0$ and a triangular component.
 - (a) Determine and sketch the autocorrelation function $R_X(\tau)$ of $X(t)$.
 - (b) What is the DC power contained in $X(t)$?
 - (c) What is the AC power contained in $X(t)$?

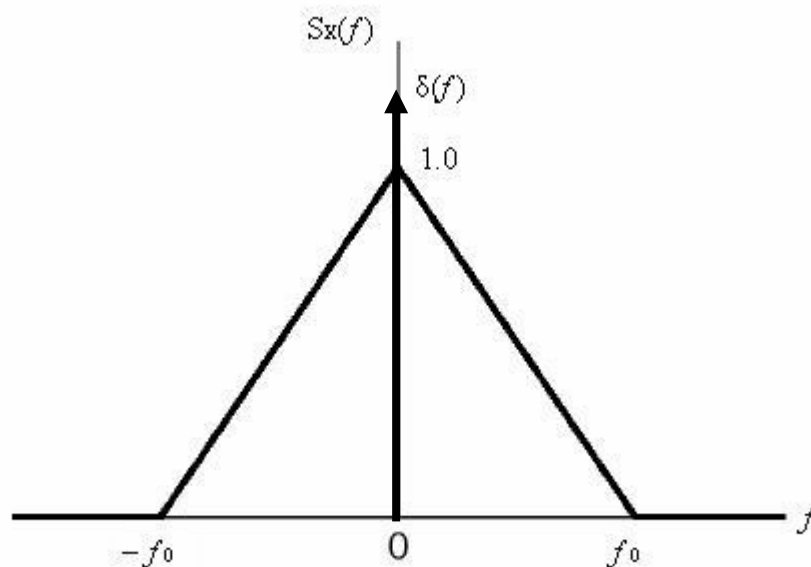


Figure 1