

Assignment-2

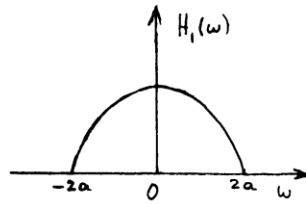
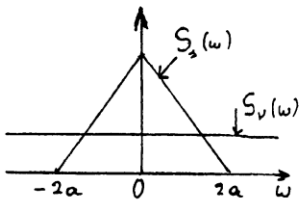
AI1110: Probability And Random Variables
IIT Hyderabad

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Q Papaulis 13.8; Find the noncausal estimators $H1(\omega)$ and $H2(\omega)$ respectively of a process $s(t)$ and its derivative $s'(t)$ in terms of the data $s(t) = s(t) + v(t)$ where

$$R_s(\tau) = A \frac{\sin^2 a\tau}{\tau^2} R_v(\tau) = N\delta(\tau) = 0(1)$$

Solution:- The fourier transform $S_s(\omega)$ of the function, $R_s(\tau) = A \frac{\sin^2 a\tau}{\tau^2} R_v(\tau)$ is a triangle



and since $S_v(\omega) = N$, yields

$$H1(\omega) = \frac{S_s(\omega)}{S_s(\omega) + S_v(\omega)}$$

$$= Aa\pi(1 - \omega/2a) \frac{1}{Aa\pi(1 - \omega/2a) + N}$$

we show next that $H2(\omega) = j\omega H1(\omega)$.