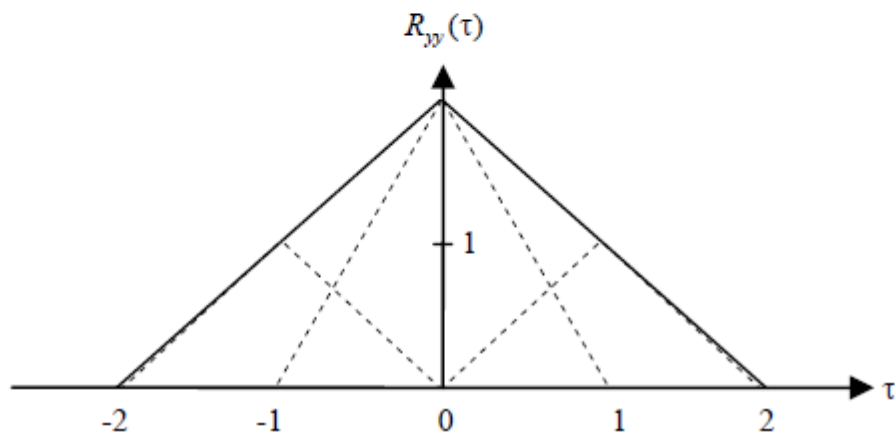


Solutions Lec 7

1.

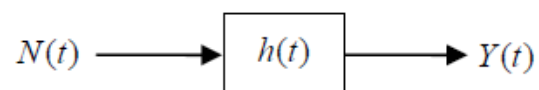
3.13 $Y(t) = X(t) * h_1(t) + X(t) * h_2(t) = X(t-1) + X(t-2)$. Thus,

$$\begin{aligned} R_{yy}(\tau) &= E \{ [X(t-1+\tau) + X(t-2+\tau)][X(t-1) + X(t-2)] \} \\ &= R_{xx}(\tau) + R_{xx}(\tau) + R_{xx}(\tau+1) + R_{xx}(\tau-1) \\ &= 2R_{xx}(\tau) + R_{xx}(\tau+1) + R_{xx}(\tau-1) \end{aligned}$$



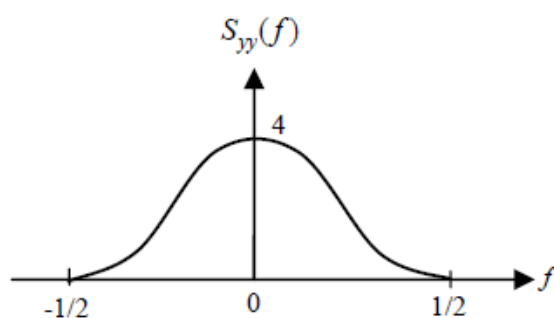
2.

3.14 (a) $Y(t) = N(t) + N(t-1)$ or, we have



with $h(t) = \delta(t) + \delta(t-1)$. From (3.135), $S_{yy}(f) = S_{mm}(f)|H(f)|^2$ where $H(f) = 1 + e^{-j2\pi f}$ and thus, $|H(f)|^2 = (1 + e^{-j2\pi f})(1 + e^{+j2\pi f}) = 2(1 + \cos 2\pi f)$.

Hence, the output power spectral density is $S_{yy}(f) = 2 \text{rect}(f)[1 + \cos 2\pi f]$.



3.

See Matlab code [Lec7.m](#)