MECH 6325 HW 1

12) $R_x(\tau) = \begin{cases} 1 - |\tau|, & \tau = [-1, 1] \\ 0, & \text{otherwise} \end{cases}$

$w_0 = \mathbb{R}$

$Y(t) = X(t) \cos(w_0 t + \lambda)$ $\quad \lambda = \begin{cases} \frac{1}{2\pi}, & [0, 2\pi] \\ 0, & \text{otherwise} \end{cases}$

$S_x(w) = \int_{-\infty}^{\infty} R_x(\tau) e^{-jw\tau} d\tau = \int_{-1}^{0} + \int_{0}^{1} (1-\tau) e^{-jw\tau} d\tau$

$A\cos(w_0 t + \lambda)$ — Uniformly Distributed across Phase

$R_{x_2} = \frac{A^2}{2} \cos(w_0 \tau)$

$S_x(w) = \frac{2(1 - \cos(w))}{w^2}$

$S_{x_2} = \frac{1}{2}\delta(w - w_0) + \frac{1}{2}\delta(w + w_0)$

$$\boxed{S_Y(Y) = \frac{1 - \cos(w)}{w^2} \left[\delta(w - w_0) + \delta(w + w_0)\right]}$$