Problem 8.32 Find the power spectral density of the process that has the autocorrelation function

$$R_X(\tau) = \begin{cases} \sigma^2\left(1-|\tau|^2\right) & |\tau|<1 \\ 0 & \text{otherwise} \end{cases}$$

Solution

The Wiener-Khintchine relations imply the power spectral density is given by the Fourier transform of $R_X(\tau)$, which is (see Appendix 6)

$$S_X(f) = \sigma^2 \text{sinc}^2(f)$$