



Problem 2.30 Determine and sketch the autocorrelation functions of the following exponential pulses:

- (a) $g(t) = \exp(-at)u(t)$
- ✓ (b) $g(t) = \exp(-a|t|)$
- ✓ (c) $g(t) = \exp(-at)u(t) - \exp(at)u(-t)$

✓ **Problem 2.32** Determine the autocorrelation function of the sinc pulse $A \text{sinc}(2Wt)$, and sketch it.

✓ **Problem 2.33** The Fourier transform of a signal is defined by $|\text{sinc}(f)|$. Show that the autocorrelation function of this signal is triangular in form.

(Hint: Find $|G(f)|^2$, then find $R_g(\tau)$)

✓ **Problem 2.35** Consider a signal $g(t)$ defined by

$$g(t) = A_0 + A_1 \cos(2\pi f_1 t + \theta) + A_2 \cos(2\pi f_2 t + \theta)$$


- (a) Determine the autocorrelation function $R_g(\tau)$ of this signal.
- (b) What is the value of $R_g(0)$?
- (c) Has any information about $g(t)$ been lost in obtaining the autocorrelation function?

(Hint use Freq. domain approach.)

Extra problem. do:

a) $y(t) = \mathcal{E}(t) \otimes \mathcal{E}(t)$ where $\mathcal{E}(t)$ is unit step function

b) $y(t) = t \int_0^t \mathcal{E}(t) \otimes e^{-at} \mathcal{E}(t)$ $a < 0$

c) $y(t) = u(t) \otimes h(t)$ where $u(t)$ 
and $h(t) = e^{-3t} u(t)$ 