ECE 901
HW #3

1) Let $Z(t)$ be AWGN. Let $\varphi_1, \ldots, \varphi_n$ be orthonormal. Put

$$\hat{Z} := \sum_{k=1}^{N} \langle Z, \varphi_k \rangle \varphi_k.$$ 

Compute $E[Z(t) \hat{Z}(t')^*]$ and $E[Z(t) \hat{Z}(t'')^*]$ and show that $E[(Z(t)-\hat{Z}(t))(\hat{Z}(t')^*)] = 0$ for all $t, t'$. 

$n$-dimensional, zero mean, 

2) Let $X$ and $Y$ be jointly Gaussian and uncorrelated; i.e., $C_{XY} = C_{YX} = 0$. Also assume $C_X = C_Y = C$. Then

$$f_{XY}(x,y) = \frac{\exp\left\{-\frac{1}{2} [x' \ y'] [C^{-1}] [x \ y]\right\}}{(2\pi)^{(2n)/2} \sqrt{(det C)^2}}.$$ 

Since $[x \ y]$ is a $2n$-dim. Gaussian vector with covariance matrix $[C \ 0]$ of size $2n \times 2n$. 

Show that $f(x,y)$ is equal to the formula at the bottom of p. G-5.

3) Derive Craig's formula (first derive $\Theta$ on p. G-9 following the approach suggested there).