Problem 1 (20pts).

Define two signal sets C_1 and C_2, $C_1 \in l_2(Z)$, $C_2 \in l_2(Z)$, where C_2 is defined as follows:

$$C_2 = \{x_2(n) \in l_2(Z), \text{ such that } \forall x_1(n) \in C_1, < x_2(n), x_1(n) >= 0\},$$

where as usual $< x_2(n), x_1(n) >$ is the inner product between $x_2(n)$ and $x_1(n)$.

1. **(10 pts)** Prove that C_2 is a subspace of $l_2(Z)$.

2. **(10 pts)** Denote $C_2^{\perp}$ the orthogonal complement of C_2 in $l_2(Z)$. Prove that $C_2^{\perp} \neq C_1$ if and only if C_1 is not a subspace.