- Recall that $Y(t) = \sum_i Y_i \psi_i(t)$ and $X'(t) = \sum_i X_i' \psi_i(t)$.
- Let $Z'(t) = \sum_i Z_i' \psi_i(t)$, where $Z_i' = \frac{1}{\sqrt{2W}} Z'\left(\frac{i}{2W}\right)$.
- Then $Y(t) = X'(t) + Z'(t)$ implies

$$Y_i = X_i' + Z_i',$$

because $\psi_i(t), -\infty < i < \infty$ are orthonormal.

- Since $Z'\left(\frac{i}{2W}\right)$ are i.i.d. $\sim \mathcal{N}(0, N_0W)$, Z_i' are i.i.d. $\sim \mathcal{N}(0, \frac{N_0}{2})$.
- So the bandlimited white Gaussian channel is equivalent to a memoryless Gaussian channel with noise power equal to $\frac{N_0}{2}$.