

MATH 416, HW 4

1. Let w be defined by

$$\hat{w}(\xi) = \begin{cases} 1 & \text{if } \xi \in (0.5, 1] \\ -1 & \text{if } \xi \in [-1, -0.5) \\ 0 & \text{otherwise.} \end{cases}$$

Show that w is admissible and compute its normalization constant.

2. Let W be the Haar wavelet function. Compute the Fourier transform of W .

3. Show that if $h = h(k) : k \in \mathbb{Z}$ is a finite-length low-pass filter, and M is any fixed integer, then the sequence defined by

$$g(k) = (-1)^k \overline{h(2M - 1 - k)},$$

for all $k \in \mathbb{Z}$, has the same length as h .

4. Show that if $h = h(k) : k \in \mathbb{Z}$ is a finite-length self-orthonormal filter, and M is any fixed integer, then the sequence defined by

$$g(k) = (-1)^k \overline{h(2M - 1 - k)},$$

for all $k \in \mathbb{Z}$, is also self-orthonormal.