

Math 464

Homework: Due on 4/23

1) Let ϕ and ψ the Haar scaling and wavelet functions, respectively. Let V_j and W_j be the spaces generated by $\phi(2^j x - k), k \in \mathbb{Z}$ and $\psi(2^j x - k), k \in \mathbb{Z}$, respectively. Consider the function defined on $0 \leq x < 1$ by

$$f(x) = \begin{cases} -2 & : 0 \leq x < 1/4 \\ 3 & : 1/4 \leq x < 1/2 \\ 1 & : 1/2 \leq x < 3/4 \\ -2 & : 3/4 \leq x < 1 \end{cases}$$

- a) Express f in terms of the basis for V_2 . Sketch f .
- b) Decompose f into its component parts in W_1, W_0 and V_0 .

2) Repeat the previous exercise with the function f given by:

$$f(x) = \begin{cases} 1 & : 0 \leq x < 1/4 \\ -4 & : 1/4 \leq x < 1/2 \\ 2 & : 1/2 \leq x < 3/4 \\ 3 & : 3/4 \leq x < 1 \end{cases}$$

3) Let V_j be the spaces generated by $\phi(2^j x - k), k \in \mathbb{Z}$, where ϕ is the Haar scaling function. On the interval $0 \leq x < 1$, find the dimensions of the spaces V_j , and W_j .