Sheet 10

Example 1. a) Express the function

$$f(x) = \begin{cases} -1 & \text{if} \quad 0 \le x < \frac{1}{4} \\ 4 & \text{if} \quad \frac{1}{4} \le x < \frac{1}{2} \\ 2 & \text{if} \quad \frac{1}{2} \le x < \frac{3}{4} \\ -3 & \text{if} \quad \frac{3}{4} \le x < 1 \end{cases}$$

in terms of the building blocks $\{\phi(2^2x), \phi(2^2x \pm 1), \phi(2^2x \pm 2) \dots\}$ of V_2. Check your answer by having Matlab plot it.

b) Find the wavelet decomposition; that is, express $f = w_0 + w_1 + f_0$, where $w_0 \in W_0$, $w_1 \in W_1$ and $f_0 \in V_0$. Check your answer by plotting it.

Example 2. a) Express the function

$$f(x) = \begin{cases} 2 & \text{if} \quad 0 \le x < \frac{1}{4} \\ -3 & \text{if} \quad \frac{1}{4} \le x < \frac{1}{2} \\ 1 & \text{if} \quad \frac{1}{2} \le x < \frac{3}{4} \\ 3 & \text{if} \quad \frac{3}{4} \le x < 1 \end{cases}$$

in terms of the building blocks of V_2 and check your answer as above.

b) Find the wavelet decomposition and check your answer.

Example 3. Repeat this for the function

$$f(x) = \begin{cases} \frac{3}{2} & \text{if} \quad -1 \le x < -\frac{3}{4} \\ -\frac{1}{2} & \text{if} \quad -\frac{3}{4} \le x < -\frac{1}{2} \\ 1 & \text{if} \quad -\frac{1}{4} \le x < 0 \\ -2 & \text{if} \quad \frac{1}{2} \le x < \frac{3}{4} \\ \frac{1}{2} & \text{if} \quad 1 \le x < \frac{5}{4} \end{cases}$$