Sheet 9

1. Express the function

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

in terms of the building blocks $\{\phi(2x), \phi(2x \pm 1), \phi(2x \pm 2) \dots\}$ of V_1. CAUTION: jumps must be 1/2 unit apart! Then give the wavelet decomposition; that is, express $f = w_0 + f_0$, where $w_0 \in W_0$ and $f_0 \in V_0$.

2. Express the function

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

in terms of the building blocks of V_1. Then give the wavelet decomposition.

3. Express the function

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

in terms of the building blocks of V_1. CAUTION: jumps must be 1/2 unit apart! Then give the wavelet decomposition.