

# Test Functions

These functions come from Donoho, D.L., & Johnstone, I.M., "Ideal spatial adaptation by wavelet shrinkage". *Biometrika*, 81, 425-455, 1994.

- **Blocks:**

$$f(t) = \sum_j h_j K(t - t_j) \quad \text{where } K(t) = (1 + \text{sgn}(t))/2$$

$$\begin{aligned} (t_j) &= ( 0.1 \quad 0.13 \quad 0.15 \quad 0.23 \quad 0.25 \quad 0.40 \quad 0.44 \quad 0.65 \quad 0.76 \quad 0.78 \quad 0.81 ) \\ (h_j) &= ( 4 \quad -5 \quad 3 \quad -4 \quad 5 \quad -4.2 \quad 2.1 \quad 4.3 \quad -3.1 \quad 2.1 \quad -4.2 ) \end{aligned}$$

- **Bumps:**

$$f(t) = \sum_j h_j K((t - t_j)/\omega_j) \quad \text{where } K(t) = 1/(1 + |t|)^4$$

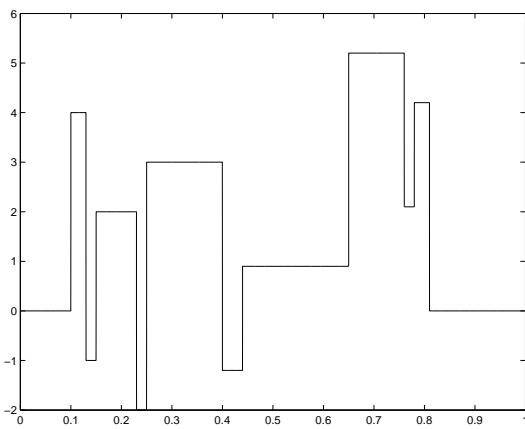
$$\begin{aligned} (t_j) &= ( 0.1 \quad 0.13 \quad 0.15 \quad 0.23 \quad 0.25 \quad 0.40 \quad 0.44 \quad 0.65 \quad 0.76 \quad 0.78 \quad 0.81 ) \\ (h_j) &= ( 4 \quad 5 \quad 3 \quad 4 \quad 5 \quad 4.2 \quad 2.1 \quad 4.3 \quad 3.1 \quad 5.1 \quad 4.2 ) \\ (\omega_j) &= ( 0.005 \quad 0.005 \quad 0.006 \quad 0.01 \quad 0.01 \quad 0.03 \quad 0.01 \quad 0.01 \quad 0.005 \quad 0.008 \quad 0.005 ) \end{aligned}$$

- **HeaviSine:**

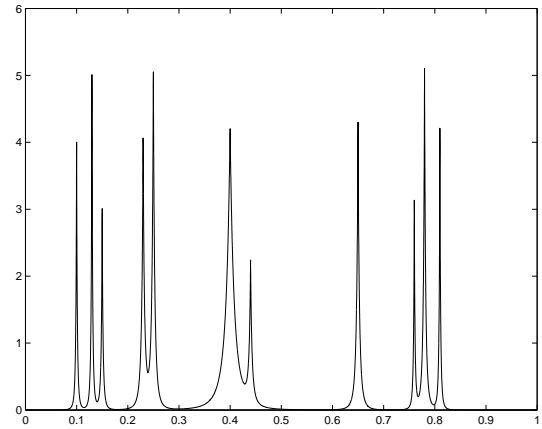
$$f(t) = 4 \sin 4\pi t - \text{sgn}(t - 0.3) - \text{sgn}(0.72 - t)$$

- **Doppler:**

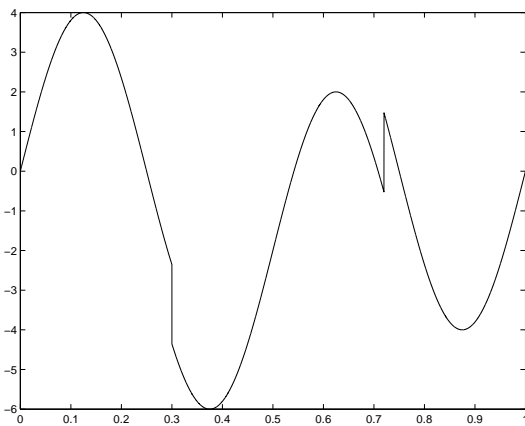
$$f(t) = [t(1 - t)]^{1/2} \sin(2\pi(1 + \epsilon)/(t + \epsilon)), \quad \epsilon = 0.05$$



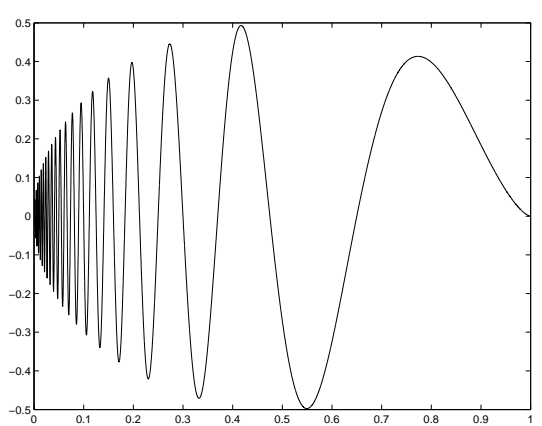
(a) Blocks



(b) Bumps



(c) HeaviSine



(d) Doppler

Figure 1: Four test functions.