Programming Study Group
Week 2

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Exercise one Draw $h(t)$ in the interval $[-9, 9]$ as defined below: (Notice that this is the same as exercise two of week 1, except for that $p(t)$ is not bounded in time)

$$h(t) = g(t)q(t),$$

where

$$p(t) = e^{-|t|}$$
$$g(t) = \sum_{m=-\infty}^{\infty} p(t - 6m)$$
$$q(t) = \frac{sin(t)}{t}$$

Exercise two Compute the integral

$$S = \int_{-\infty}^{\infty} \delta(t^3 - 8t)dt$$

in which an approximation of unit impulse must be used as follows:

$$\delta_{\Delta}(t) = \begin{cases} \frac{1}{\Delta} & -\frac{\Delta}{2} < t < \frac{\Delta}{2} \\ 0 & \text{elsewhere.} \end{cases}$$

Avoid using analytic relations for finding roots or calculating derivatives. Check your answer using the following relation:

$$\int_{-\infty}^{\infty} \delta(f(t))dt = \sum_{k=1}^{N} \frac{1}{|f'(t_k)|},$$

where t_k denotes k$^{\text{th}}$ root of $f(t)$ and N is the number of roots.