UNIVERSITY OF CATANIA – Department of Mathematics and Computer Sciences

Master degree in Mathematics - May 9^{th} 2020

Exercise 1. Evaluate the derivative of

$$f(t) = \sum_{n=0}^{+\infty} (\mathcal{U}(t-n-1) - \mathcal{U}(t-n))$$

Exercise 2. Evaluate the gradient of

$$\mathcal{U}(x,y) = \begin{cases} 1 & \text{if } x > 0 \text{ and } y \in \mathbb{R} \\ 0 & \text{if } x \leq 0 \text{ and } y \in \mathbb{R} \end{cases}$$

in $\mathcal{D}'(\mathbb{R}^2)$.

Exercise 3. Evaluate the derivative of

$$\mathcal{V}(x,y) = \begin{cases} 1 & \text{if } |x| < 1 \text{ and } |y| < 1 \\ 0 & \text{otherwise} \end{cases}$$

in $\mathcal{D}'(\mathbb{R}^2)$.