Homework Assignment #5
(Convolution & Adaptive Median Filtering)

A. *(40 points)* **Derive and sketch** the convolution $g(x) = f(x) * h(x)$ in the continuous domain, where

$$f(x) = \begin{cases} 1 & \text{if } 0 \le x \le 2 \\ 0 & \text{otherwise} \end{cases} \quad \text{and}$$

$$h(x) = \begin{cases} e^{2x} & \text{if } x \le 2 \\ 0 & \text{otherwise} \end{cases}.$$

B. *(60 points)* Write your **own program/function** (using Matlab/C/C++/Java/Python) for performing **adaptive median filtering** (AMF; the AMF algorithm can be found in Page 386 of the textbook). Apply your AMF function to noise corrupted images for noise removal. Investigate the effectiveness of AMF in removing noise of higher density than using MATLAB built-in function medfilt2() (i.e., demonstrating that AMF can better handle noise with high density than median filtering).

NOTE: (1) For A, your solution should include **detailed steps and sketches**.
(2) For B, you need to turn in **a written report** (in the pdf format), including the following sections: (1) Experimental Results and (2) Discussion & Conclusion. In addition, you need to turn in your **MATLAB implementation codes in a separate file**.