EE 2000 Assignment # 4

(taken from Dr. Jingxian Wu, University of Arkansas, 2020.)

Define a rectangular pulse $p(t) = u(t+1) - u(t-1) = \begin{cases} 1, & -1 \le t \le 1 \\ 0, & \text{otherwise} \end{cases}$.

1. Evaluate the following convolutions ($a > 0, b > 0$).

   (a) $u(t) \otimes u(t)$

   (b) $p\left(\frac{t-a}{a}\right) \otimes \delta(t-b)$

   (c) $p\left(\frac{t}{a}\right) \otimes p\left(\frac{t}{a}\right)$

   (d) $p\left(\frac{t}{a}\right) \otimes u(t)$.

   (e) $tu(t) \otimes p\left(\frac{t}{a}\right)$

2. An LTI system has an impulse response as $h(t) = \exp(-2t)u(t)$. If the input is $x(t) = \exp(-t)u(t) + u(t)$, find the output of the system.

3. **Graphically** evaluate the convolution: $p(t) \otimes p(t)$.