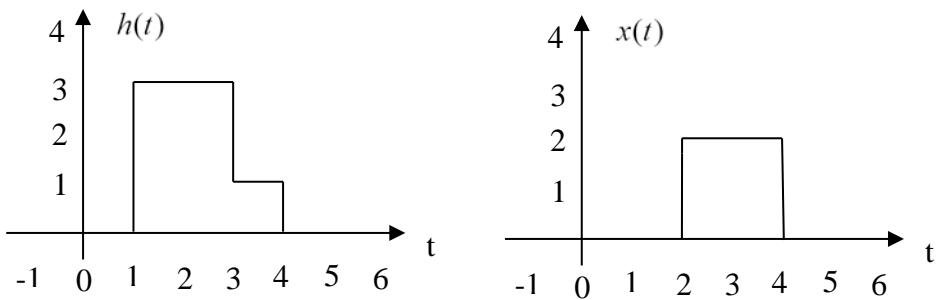


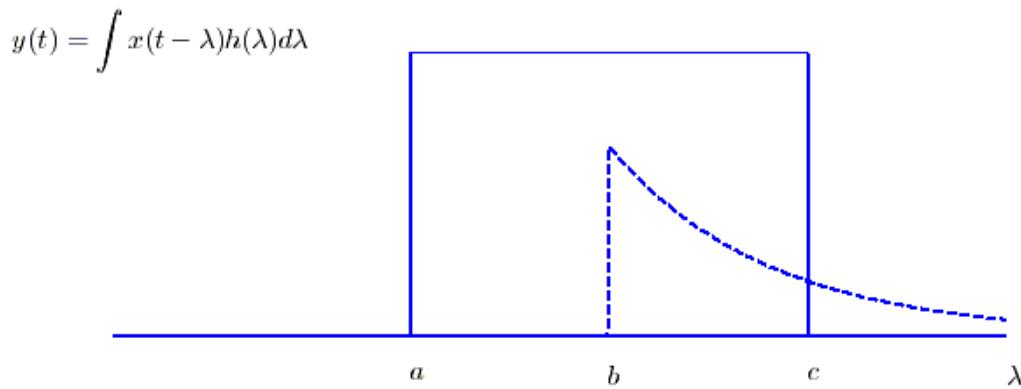
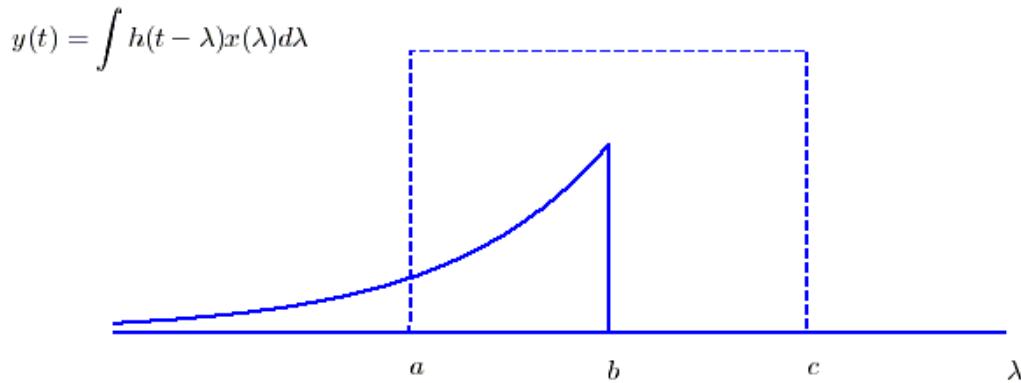
## ECE-205 Practice Quiz 6

Problems 1 - 4 refer to the following linear time invariant (LTI) system, with impulse response  $h(t)$  shown below on the left, and input  $x(t)$  shown below on the right. The output of the system,  $y(t)$ , is the convolution of the impulse response with the input,  $y(t) = h(t) * x(t)$ .



- 1) Is this LTI system causal?  
a) Yes b) No
  
- 2) The maximum value of  $y(t)$  is  
a) 4 b) 5 c) 6 d) 12 e) 14
  
- 3)  $y(t)$  is zero until what time?  
a) 0 b) 1 c) 2 d) 3 e) 4
  
- 4)  $y(t)$  will return to zero at what time?  
a) 6 b) 7 c) 8 d) 9 e) 10

For problems **5-10**, assume we are going to convolve the impulse response  $h(t) = 2e^{-t/0.8}u(t)$  with input  $x(t) = 3[u(t+1) - u(t-1)]$ .



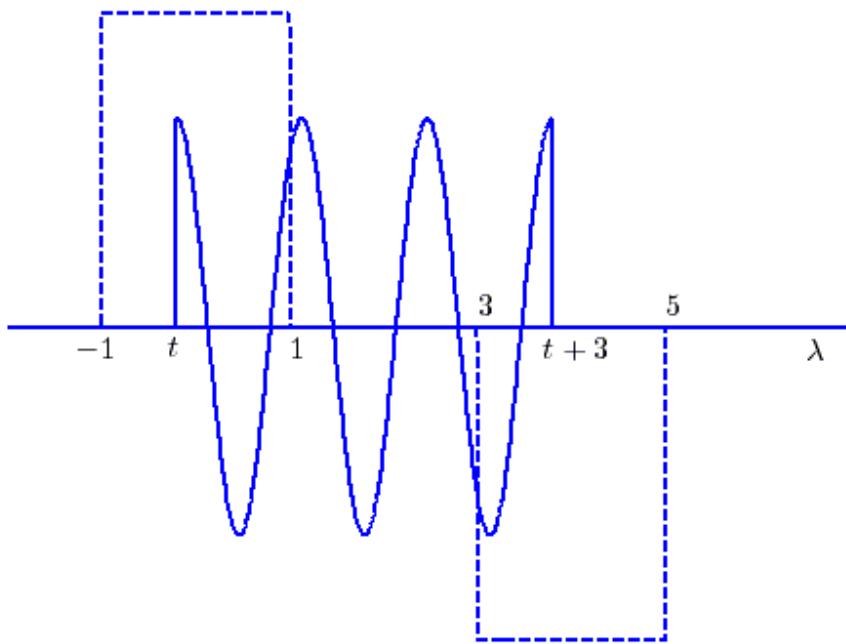
For problems **5-7**, assume we perform the convolution using the form  $y(t) = \int h(t-\lambda)x(\lambda)d\lambda$ , depicted in the top panel in the above figure.

- 5)** The parameter  $a$  is equal to a) 0 b) 1 c) -1 d)  $t$  e)  $\lambda$  f) none of these
- 6)** The parameter  $b$  is equal to a) 0 b) 1 c) -1 d)  $t$  e)  $\lambda$  f) none of these
- 7)** The parameter  $c$  is equal to a) 0 b) 1 c) -1 d)  $t$  e)  $\lambda$  f) none of these

For problems **8-10**, assume we perform the convolution using the form  $y(t) = \int h(\lambda)x(t-\lambda)d\lambda$ , depicted in the bottom panel in the above figure.

- 8)** The parameter  $a$  is equal to a)  $t-1$  b)  $t+1$  c) -1 d) 1 e) none of these
- 9)** The parameter  $b$  is equal to a)  $t-1$  b)  $t+1$  c) -1 d) 1 e) none of these
- 10)** The parameter  $c$  is equal to a)  $t-1$  b)  $t+1$  c) -1 d) 1 e) none of these

For problems **11-16**, assume we are convolving two functions, and at some point we have the configuration shown below:



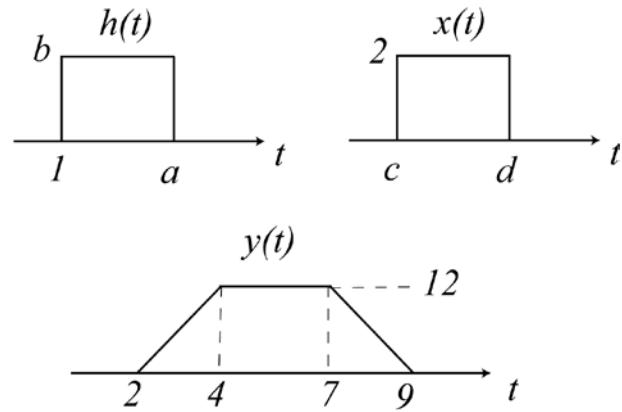
The output at this time can be written as the sum of two integrals,

$$y(t) = \int_a^b x(\lambda)h(t-\lambda)d\lambda + \int_c^d x(\lambda)h(t-\lambda)d\lambda$$

- 11)** The value of the parameter  $a$  is a) -1 b) 1 c) 3 d) 5 e)  $t$  f)  $t+3$
- 12)** The value of the parameter  $b$  is a) -1 b) 1 c) 3 d) 5 e)  $t$  f)  $t+3$
- 13)** The value of the parameter  $c$  is a) -1 b) 1 c) 3 d) 5 e)  $t$  f)  $t+3$
- 14)** The value of the parameter  $d$  is a) -1 b) 1 c) 3 d) 5 e)  $t$  f)  $t+3$
- 15)** This sketch is valid for  
a)  $-1 < t < 1$  b)  $3 < t < 5$  c)  $0 < t < 2$  d)  $0 < t < 1$  e) none of these
- 16)** Is this a causal system? a) yes b) no c) it is not possible to tell

**17)** An LTI systems has impulse response, input, and output as shown below. Determine numerical values for the parameters  $a$ ,  $b$ ,  $c$ , and  $d$ . Note that the diagram is not to scale!

Assume  $a-1 < d-c$  or  $h(t)$  is narrower than  $x(t)$ .



Answers:, 1-a, 2-d, 3-d, 4-c, 5-c, 6-d, 7-b, 8-a, 9-e, 10-b, 11-e, 12-b, 13-c, 14-f, 15-d, 16-b, 17 ( $a=3$ ,  $b=3$ ,  $c=1$ ,  $d=6$ )