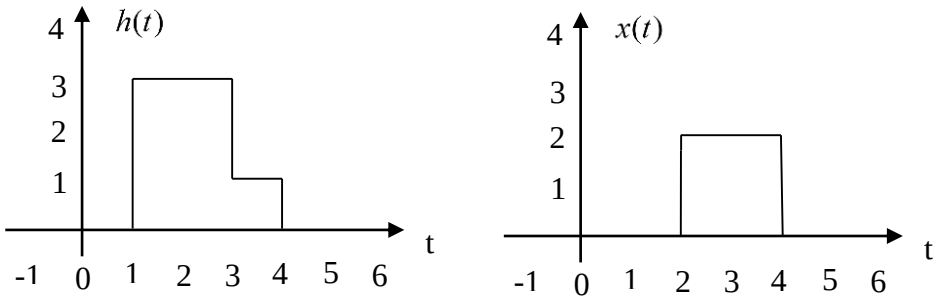
ECE-205 Practice Quiz 6

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, $y(t) = h(t) * x(t)$.



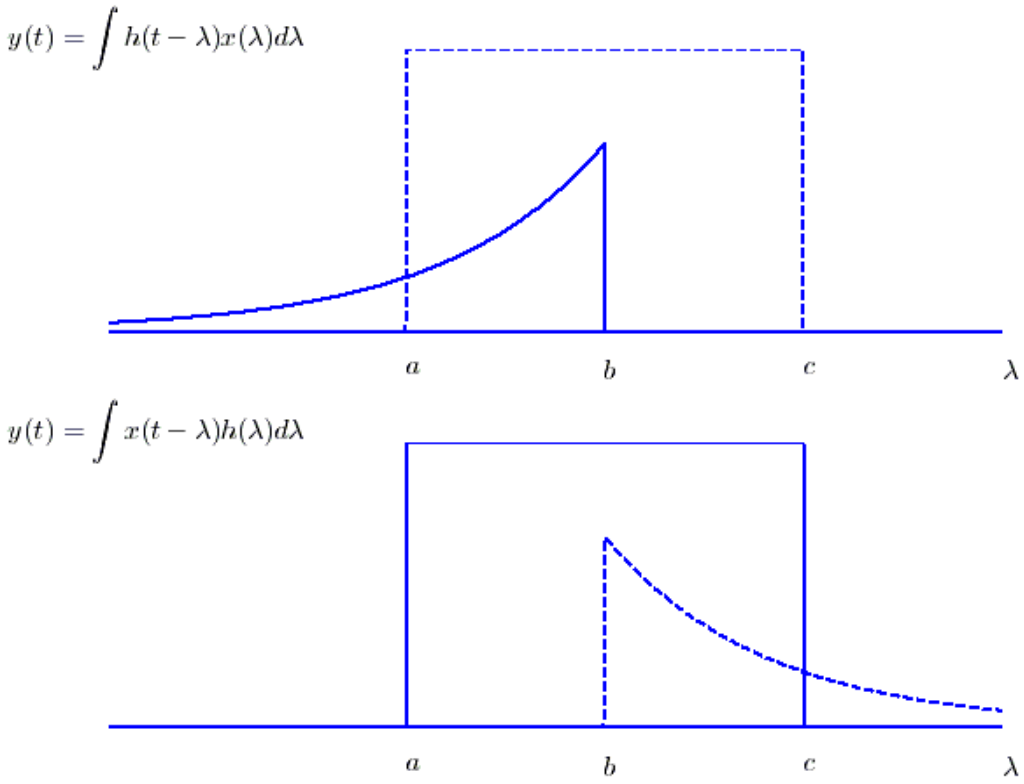
1) Is this LTI system causal? a) Yes b) No

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 $h(t) = 2e^{-t/0.8}\text{u(t)}$ with input $x(t) = 3\left[u(t+1) - u(t-1)\right]$.



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) λ f) none of these

6) The parameter *b* is equal to a) 0 b) 1 c) -1 d) t e) λ f) none of these

7) The parameter *c* is equal to a) 0 b) 1 c) -1 d) t e) λ f) none of these

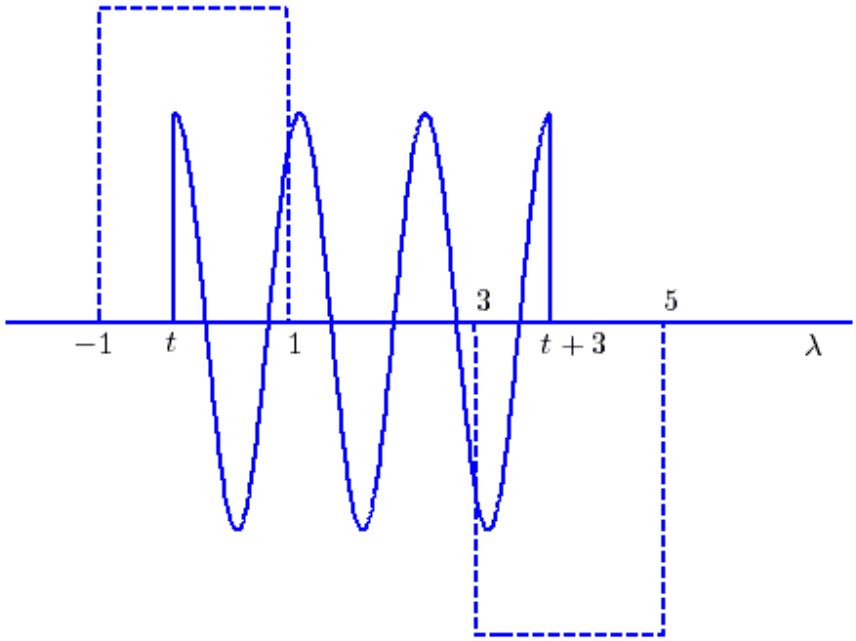
For problems **8-10**, assume we perform the convolution using the form $y(t) = \int h(\lambda)x(t-\lambda)d\lambda$, depicted in the bottom panel in the above figure.

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,

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

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) $t+3$

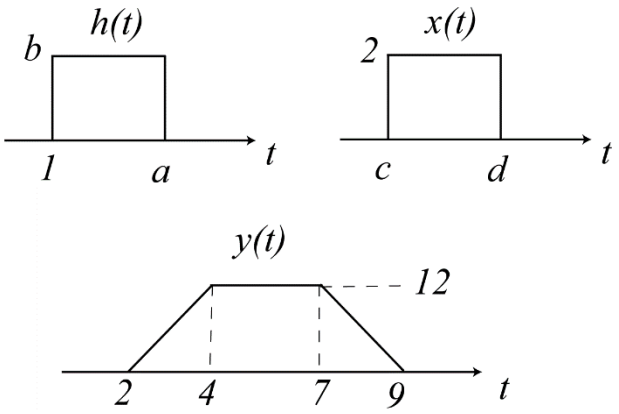
15) This sketch is valid for

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)