

### ECE-205 Quiz 4

Fill in the following table with a Y (yes) or N (no) for each of the system models given. Assume  $-\infty < t < \infty$  for all of the systems and all initial conditions are zero.

System	System Model	Linear?	Time-Invariant?	Causal?	Memoryless?
1	$y(t) = e^{t-1}x(t+1)$				
2	$y(t) = x\left(t - \frac{1}{2}\right)$				
3	$y(t) = x(1-t)$				
4	$\dot{y}(t) + y(t) = e^{-t}x(t)$				
5	$y(t) = \int_{-\infty}^t e^{-(t-\lambda)}x(\lambda+1)d\lambda$				
6	$y(t-1) = \cos(t)x(t)$				
7	$y(t) = x\left(\frac{t}{2}\right)$				
8	$y(t) = \frac{1}{2}[x(t-1) + x(t+1)]$				

**9)** For a system with input  $x(t)$  and output  $y(t)$ , is it necessary for  $y(t_0) = 0$  in order for the system to be **linear**?

- a) Yes   b) No

**10)** For a system with input  $x(t)$  and output  $y(t)$ , is it necessary for  $y(t_0) = 0$  in order for the system to be **time-invariant**?

- a) Yes   b) No

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**11)** If we have the integral  $y(t) = \int_1^t e^{-\lambda} x(\lambda - T) d\lambda$  and we make the substitution  $\sigma = \lambda - T$ , the resulting integral is

a)  $y(t) = \int_1^t e^{-\sigma-T} x(\sigma) d\sigma$    b)  $y(t) = \int_1^{t-T} e^{-\sigma-T} x(\sigma) d\sigma$    c)  $y(t) = \int_{1-T}^{t-T} e^{-\sigma-T} x(\sigma) d\sigma$    d) none of these

**12)** If we have the integral  $y(t) = \int_1^t e^{-\lambda} x(-2\lambda) d\lambda$  and we make the substitution  $\sigma = -2\lambda$ , the resulting integral is

a)  $y(t) = -2 \int_1^t e^{-\sigma/2} x(\sigma) d\sigma$    b)  $y(t) = -\frac{1}{2} \int_1^{-2t} e^{-\sigma/2} x(\sigma) d\sigma$    c)  $y(t) = -\frac{1}{2} \int_{-2}^{-2t} e^{-\sigma/2} x(\sigma) d\sigma$    d) none of these

**13)** If we have the integral  $y(t) = \int_{-\infty}^t e^{-(t-\lambda)} x(2-3\lambda) d\lambda$  and we make the substitution  $\sigma = 2-3\lambda$ , what do we get? (write out the answer, don't worry about simplifying it)