

ECE-205 Practice 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	$y(t) = 3 \sin(t+1)x(t-1)$				
2	$y(t) = x\left(\frac{t}{2}-1\right)$				
3	$y(t) = x(1-t)$				
4	$\dot{y}(t) + t^2 y(t) = \sin(t)x(t)$				
5	$y(t) = \int_{-\infty}^t e^{-(t-\lambda)} x(\lambda+1) d\lambda$				
6	$y(t) = 3e^{t+1}x(t)$				
7	$y(t) = x\left(\frac{t}{2}\right)$				
8	$y(t) = \frac{1}{2} [x(t-1) + x(t+1)]$				
9	$\dot{y}(t) + y(t) = x(t) + 2$				
10	$y(t) = e^{x(t)}$				

11) 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

12) 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

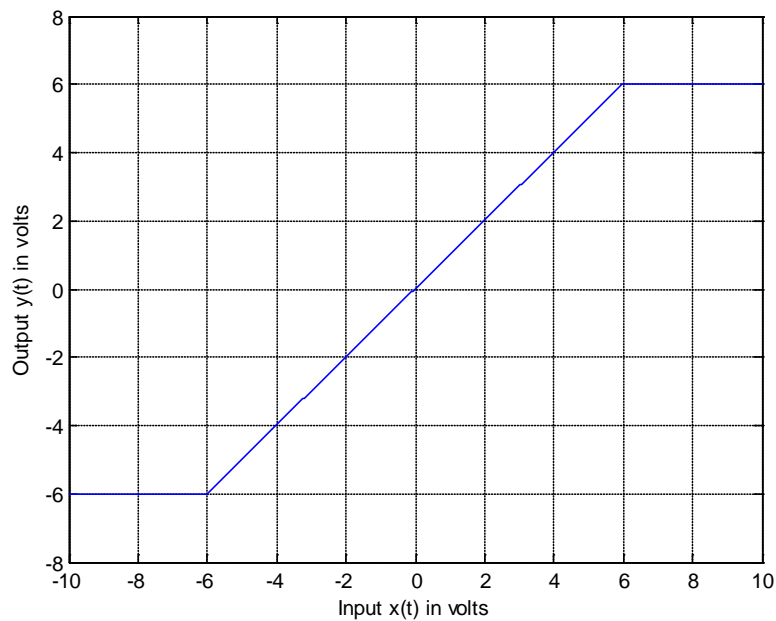
13) For a system with input $x(t)$ and output $y(t)$, is it necessary for $y(t_0) = 0$ in order for the system to be **causal**?

a) Yes b) No

14) 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 **memoryless**?

a) Yes b) No

Problems 15 and 16 refer to a system with an input/output relationship shown below



15) Is this a **linear** system? a) Yes b) No

16) Is this an **invertible** system? a) Yes b) No

17) Is the system $y(t) = mx(t) + b$ and **invertible** system? a) Yes b) No

18) Is the system $y(t) = \cos(x(t)) + 1$ an **invertible** system? a) Yes b) No

19) If we made the variable substitution $\sigma = \frac{\lambda}{2}$ in the integral $\int_2^6 x\left(\frac{\lambda}{2}\right) d\lambda$, the new integral is

a) $\frac{1}{2} \int_2^6 x(\sigma) d\sigma$ b) $2 \int_2^6 x(\sigma) d\sigma$ c) $\frac{1}{2} \int_1^3 x(\sigma) d\sigma$ d) $2 \int_1^3 x(\sigma) d\sigma$ e) none of these

20) If we made the variable substitution $\sigma = \lambda - 1$ in the integral $\int_{-\infty}^t e^{\lambda} x(\lambda - 1) d\lambda$, the new integral is

a) $\int_{-\infty}^{t-1} e^{\sigma+1} x(\sigma) d\sigma$ b) $\int_{-\infty}^t e^{\sigma+1} x(\sigma) d\sigma$ c) $\int_{-\infty}^t e^{\sigma} x(\sigma) d\sigma$ d) $2 \int_{-\infty}^{t-1} e^{\sigma} x(\sigma) d\sigma$ e) none of these

21) If we made the variable substitution $\sigma = 1 - 2\lambda$ in the integral $\int_0^5 x(1 - 2\lambda) d\lambda$, the new integral is

a) $\int_0^5 x(\sigma) d\sigma$ b) $\frac{-1}{2} \int_0^5 x(\sigma) d\sigma$ c) $\frac{1}{2} \int_{-9}^1 x(\sigma) d\sigma$ d) $\int_{-9}^1 x(\sigma) d\sigma$ e) none of these

1-L, not TI, C, not M; 2-L, not TI, not C, not M, 3-L, not TI, not C, not M, 4-L, not TI, C, not M,

5- L, TI, not C, not M, 6-L, not TI, C, M, 7-L, not TI, not C, not M, 8-L, TI, not C, not M

9-not L, TI, C, not M, 10- not L, TI, C, M

11- a, 12-a, 13-b, 14-b, 15-b, 16-b, 17-a, 18-b, 19-d, 20-a, 21-c