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	$y(t) = \frac{1}{2}\left[x(t-1) + x(t+1)\right]$				
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

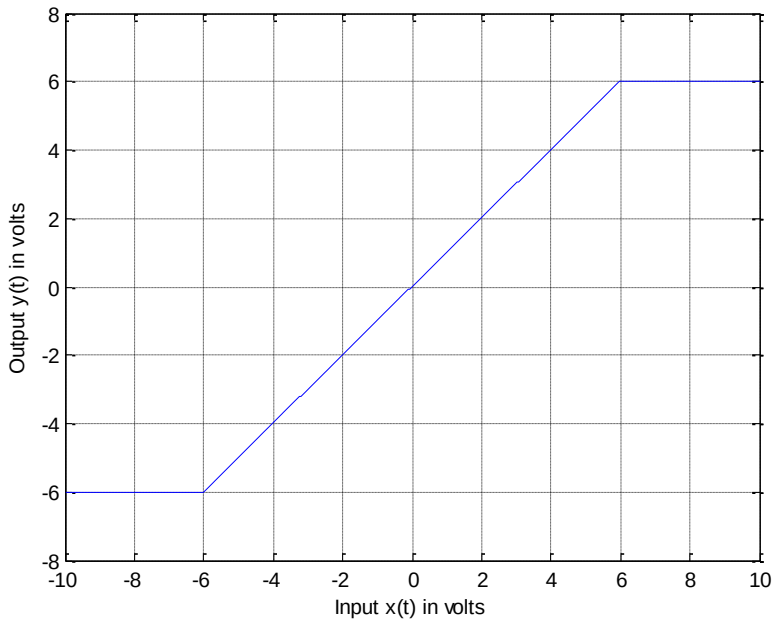
13) For a system with input $x(t)$ and output $y(t)$, is it necessary for $y(t_0) = 0$ in order for the system to be **causal**?

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*