Serial #

- 1 points for not writing your serial number

King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE207: Signals and Systems (122)
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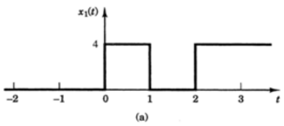
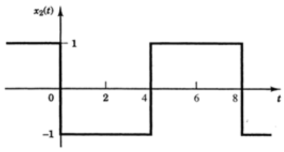
Quiz 2: Continuous-Time Signals and Systems

Name: Key ver.1

a) Express $x_1(t)$ as a function of $x_2(t)$ *Explain the components of your answer*
(4 points)





$$\boldsymbol{x_1(t) = -2x_2(4t) + 2}$$

Invert the magnitude of $x_2(t)$ and scale the magnitude by two. Then shift the magnitude up by 2 units and finally compress in time by 4 times.

b) Evaluate the following integrals: **(3 points)**

a. $\int_{-\infty}^{+\infty} \cos(3t)\,\delta(t)dt = \cos(3(0)) = 1$

b. $\int_{-\infty}^{t} \delta(\tau + 1)d\tau = u(t + 1)$

c. $\int_{-\infty}^{+\infty} \sin(3t + 1)\,\delta(t + 1)dt = \sin(3(-1) + 1) = \sin(-2) = 0.9093$

c) Determine whether the system described by $y(t) = x(2t) + 1$ is **(3 points)**

Just circle the correct answer

a. Memoryless (Yes, No)
b. Causal (Yes, No)
c. Time invariant (Yes, No)
d. Invertible (Yes, No)
e. Stable (Yes, No)
f. Linear (Yes, No)

Why $y(t) = x(2t)$ is time-varying?
We take one signal $x_1(t)$ and find its output $y_1(t)$. Then we delay the input to get $x_2(t)$ and find the output $y_2(t)$ and see if it is equal to a delayed version of $y_1(t)$. If yes then it is time-invariant.
$y_1(t) = x_1(2t)$ by definition
Let $x_2(t) = x_1(t - t_0)$ which is delayed version of the original input
$y_2(t) = x_2(2t) = x_1(2t - t_0)$ from the relation between $x_1(t)$ and $x_2(t)$
$y_1(t - t_0) = x_1(2(t - t_0)) = x_1(2t - 2t_0)$ different than $y_2(t)$ hence time-varing

You can also use simple numbers :

$$y(1) = x(2)$$
$$y(2) = x(4)$$
$$y(3) = x(6)$$

Now delay the above results by 1 second:

$$y(0) = x(1)$$
$$y(1) = x(3)$$
$$y(2) = x(5)$$

Now $y(1)$ depends on $x(3)$ instead of $x(2)$ and so on

Good Luck, **Dr. Ali Muqaibel**