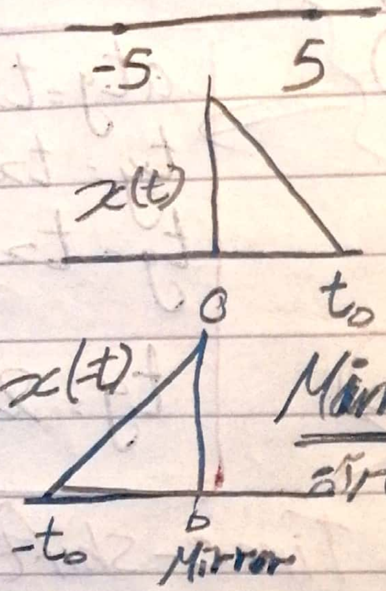
Lec. 3

B110 (Signal and system)

Signal Transformation

Time-Reverse :-

$x(t)$ → Time-reverse → $x(-t)$



Mirroring
انعكاس مرآة

Time-Shift :-

$x(t)$ Time-advanced

$t+2=5$

$t=3$

Time-advance ⇐ $x(t+t_0)$ $\quad t+t_0=5 \quad t=5-t_0$

Time-delay ⇐ $x(t-t_0)$

$x(t)$ $\quad t_x$

$y(t)=x(t+t_0)$

$t_y+t_0=t_x$

$t_y=t_x-t_0$

Time-advance

Time-delay

$t-2=5$

$t=5+2$

$t=7$

$x(t)$ $\quad t_x$

$y(t)=x(t-t_0)$

$t_y-t_0=t_x \quad t_y=t_x-t_0$

Time-delay

Time-scaling:-

$x(t)$

$y(t) = x(at)$ ⟹ $a\,t_y = t_x$, $t_y = t_x \cdot \frac{1}{a}$

$a > 1$ — Shrinking ضغط

$x(2t)$ $\quad a = 2$

$x(t)$

$y(t) = x(at)$ ⟹ $a\,t_y = t_x$, $t_y = t_x \cdot \frac{1}{a}$, $t_y = t_x \cdot \frac{1}{\frac{1}{2}}$, $t_y = 2\,t_x$

$a < 1$ — Expansion تمدد

$a = \frac{1}{2}$

Q:- $x(t) \Longrightarrow x(at-b)$

Time-scaling — Time-Reverse — Time-shift

① Time-shift first, then TS & TR

② TS & TR, then time-shift

OR

Justify your answer

تغيير في الإشارة
أو ضرب عامل مشترك

$-t$

$x(t) \Longrightarrow x(at-b)$

Solution:: بالإشارة بالإشارة
طبيعية عكسية

إجابة صحيحة

[1] Time-Shift $y_1(t) = x(t-b)$
TR & TS

$y(t) = y_1(at) = x(at-b)$

[2] TR & TS $y_1(t) = x(at)$
Time-shift $y(t) = y_1(t-b)$

إجابة خطأ

تعديل

$= x(a[t-b])$

$= x(at-ab)$

$x(t)$

عامل مشترك

$x(at-b)$

$= x(a[t-\frac{b}{a}])$ ⟸ نشتغل على Form دي

إجابة صحيحة بعد التعديل

[1] TR & TS $y_1(t) = x(at)$

Time-shift $y(t) = y_1(t-\frac{b}{a})$

$= x(at-b)$

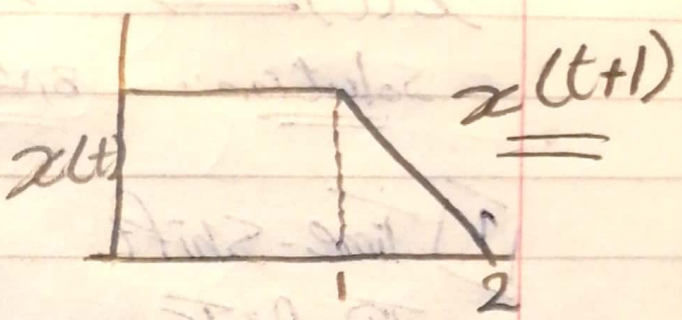
تحويل $x(-5t+3)$ Time-advance

$x(-5(t-\frac{3}{5}))$ Time-delay

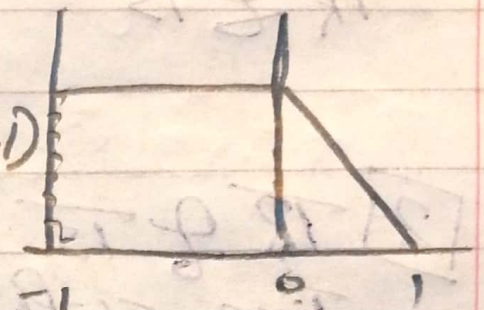
advance of Time

and delay of time.

Q2:



$x(t+1)$

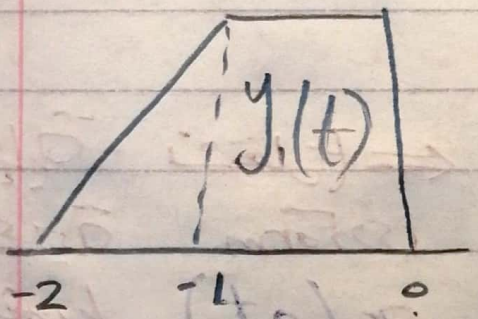


$x_1(-t+1)$

$x(-t+1)$

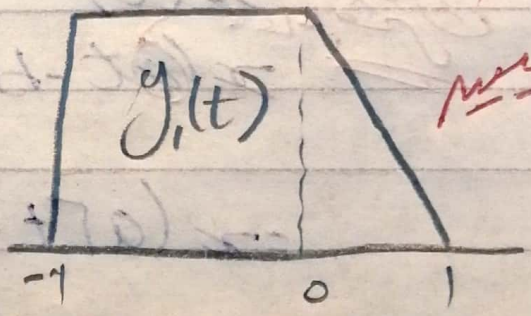
$x(-[t-1])$

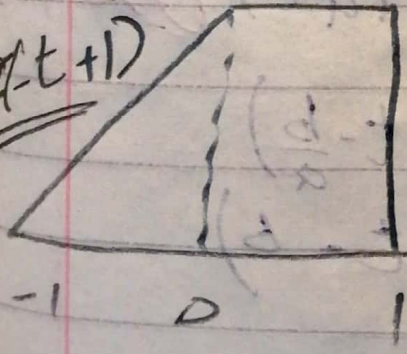
$y_1(t) = x(t)$

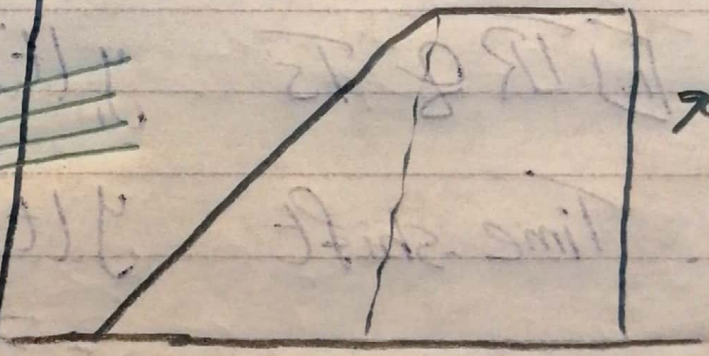


$x(-t+1)$

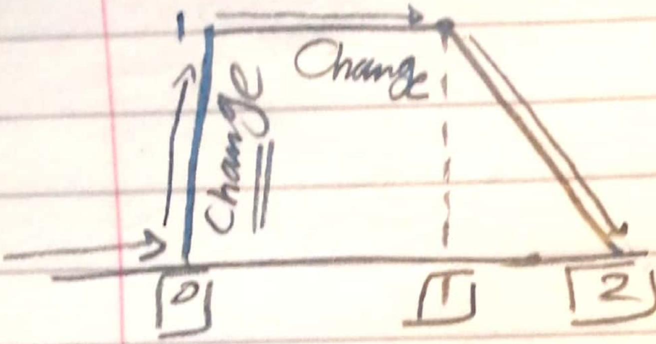
$y_1(t) = x(t+1)$







$x(at-b)$ $at-b$ = Key-Points

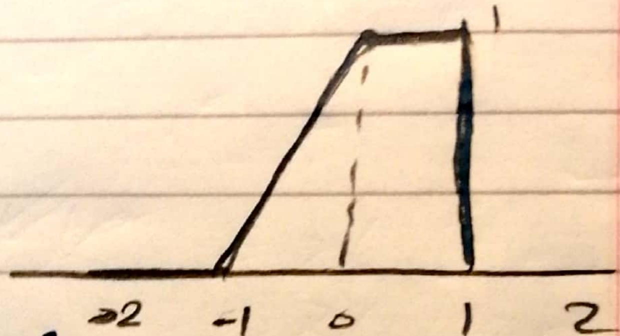


$-t+1=0$
$-t=-1$
$t=1$

$-t+1=1$
$-t=0$
$t=0$

$-t+1=2$
$-t=+1$ [illegible] $t=-1$

$0 \rightarrow 1$
$1 \rightarrow 0$
$2 \rightarrow -1$



in.v $x[an-b]$

new n = fraction X يهمل

neglect [illegible]