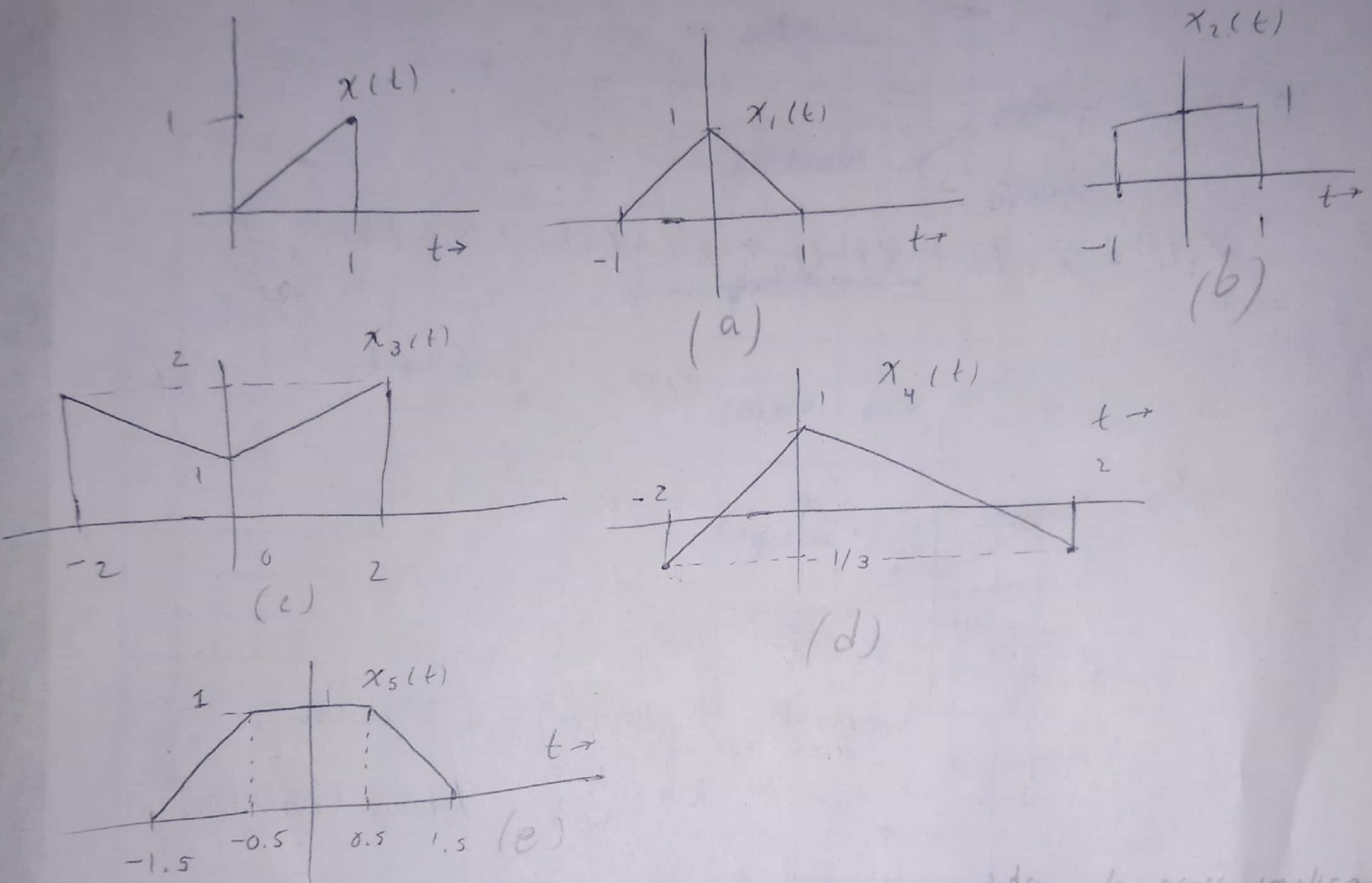
PR01

Montiel Cruz Jorge de Jesús

1.2.3 exprese las señales $x_1(t)$, $x_3(t)$, $x_4(t)$ y $x_5(t)$ y $x_2(t)$ en términos de la señal $x(t)$ usando traslamientos, escalamientos o reflexiones



Sol. es conocido que $x(t)$ está comprendida entre 0 y 1, lo cual implica que está multiplicada por $(u(t)-u(t-1))$ factor que se omitirá escribir por razones de estética

así, para $x_1(t)$

$$x_1(t) = x(-t+1) + x(t+1)$$

$$= (-t+1)[u(-t+1) - u(-t+1-1)]$$

$$+ (t+1)[u(t+1) - u(t+1-1)]$$

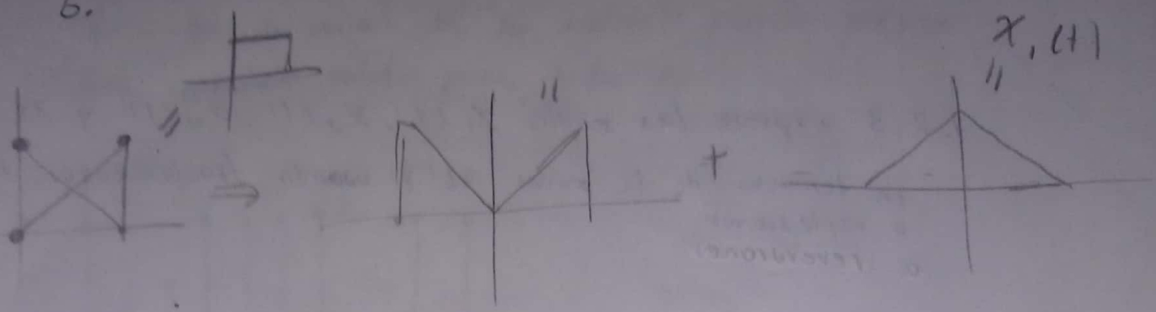
completo

$$(-t+1)[u(-t+1) - u(-t)] + (t+1)[u(t+1) - u(t)]$$

$$= (-t+1)[u(t) - u(t-1)] + (t+1)[u(t+1) - u(t)]$$

b.

$x(t)+x(-t)$



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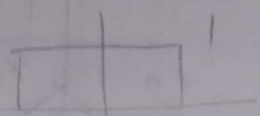
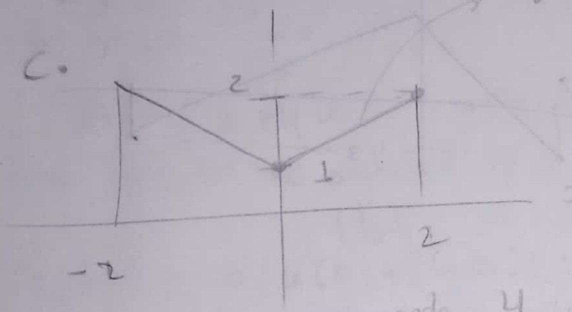


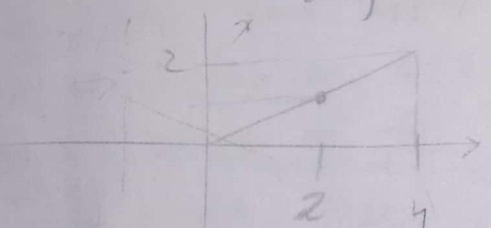
$$x_2(t) = x(t) + x(-t) + x(-t+1) + x(t+1)$$

$x_0(t) = \frac{1}{2}t + 1 \qquad 0 \le t \le 2$

c.



alargando 4 horizontal y 2 vertical



$2x(\frac{t}{4})$ tenemos entonces

$2\frac{t}{4}$ si $t=2$

$x=1$ punto donde queremos que cruce la gráfica

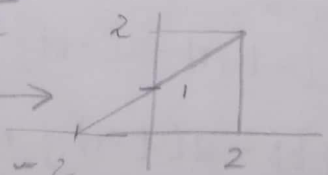
desplazamos a unidades a la izquierda

$2x(\frac{t}{4}+a) = 2x(\frac{1}{4}(t+4a))$

si queremos desplazar 2 unidades

$\Rightarrow 4a=2 \rightarrow a=\frac{1}{2}$

$\Rightarrow 2x(\frac{t}{4}+\frac{1}{2}) \longrightarrow$



el pequeño sobrante izquierdo

$x(\frac{t}{2}+b) = x(\frac{1}{2}(t+2b)) \rightarrow 2b=2,\ b=1 \rightarrow x(\frac{t}{2}+1) \rightarrow$

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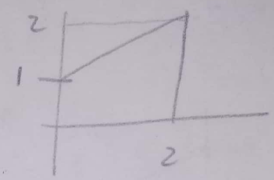
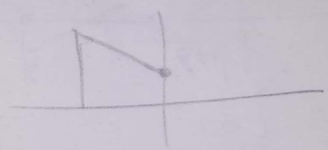
$\rightarrow$

$2x\left(\frac{t}{4}+\frac{1}{2}\right) - x\left(\frac{t}{2}+1\right)$



ahora sumamos una reflexión

$2x\left(-\frac{t}{4}+\frac{1}{2}\right) - x\left(-\frac{t}{2}+1\right)$



$x_3(t) = 2\left(x\left(\frac{t}{4}+\frac{1}{2}\right)+x\left(-\frac{t}{4}+\frac{1}{2}\right)\right)-\left(x\left(\frac{t}{2}+1\right)+x\left(-\frac{t}{2}+1\right)\right)$

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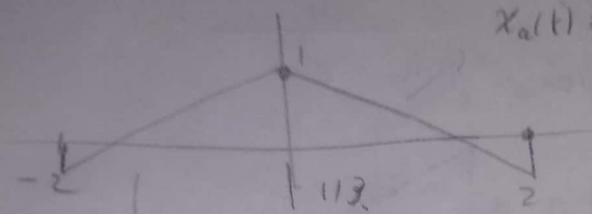
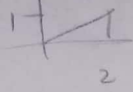
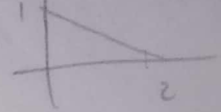
d.

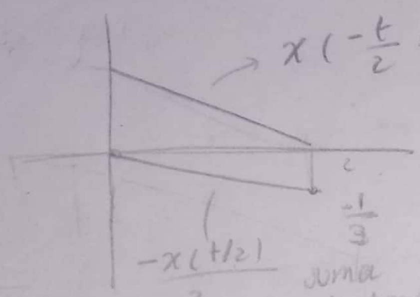


$x_a(t) \Rightarrow \frac{-\frac{1}{3}-1}{2} = \frac{-4}{6} = \frac{-2}{3} = m$

$x_a(t) = -\frac{2}{3}t + 1$

$\frac{2}{3}t + 1$

$x(t) \xrightarrow{\text{Dada}} x(\frac{t}{2}) \rightarrow$  $\rightarrow x(-\frac{t}{2}+1) \Rightarrow$ 



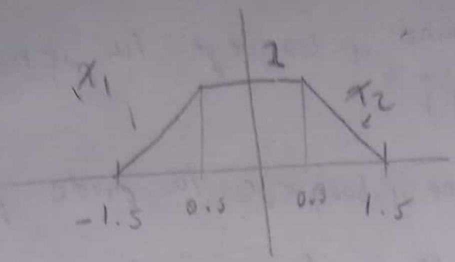
$-\frac{x(\frac{t}{2})}{3}$

$\left. x(-\frac{t}{2}+1) - \frac{x(\frac{t}{2})}{3} \right\}$ Parte derecha

Para la parte izquierda sólo sumamos una reflexión

$x_4(t) = x(-\frac{t}{2}+1) - \frac{x(\frac{t}{2})}{3} + x(\frac{t}{2}+1) - \frac{x(-\frac{t}{2})}{3}$

c.



Para las rampas

$x_1 = t + 1.5$

$x_2 = -t + 1.5$

operando sobre $x(t)$

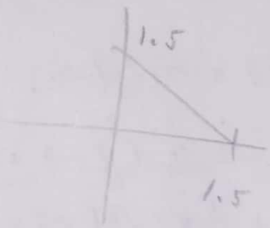
$1.5\, x\left(\frac{t}{1.5} + a\right)$

$= 1.5\, x\left(\frac{1}{1.5}(t + 1.5a)\right)$

si en $t = 1.5$ $\quad t + 1.5a = 0$

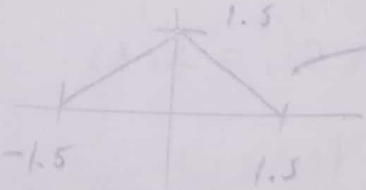
$\Rightarrow a = 1$

$1.5\, x\left(\frac{t}{1.5} + 1\right) \longrightarrow$



sumamos su reflexión

$1.5\, x\left(\frac{-t}{1.5} + 1\right)$



$1.5\left[x\left(\frac{t}{1.5} + 1\right) + x\left(\frac{-t}{1.5} + 1\right)\right]$

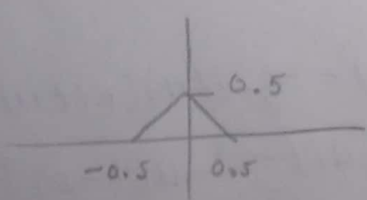
ahora, para hacer el escalón de -0.5 a 0.5 restamos un triángulo de -0.5 a 0.5 pero de altura 0.5, así

$0.5\, x\left(\frac{t}{0.5} + a\right) = 0.5\, x\left(\frac{1}{0.5}(t + 0.5a)\right) \quad t + 0.5a = 0$

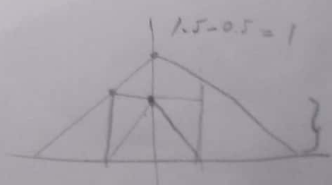
si $t = 0.5$

$a = 1$

el triángulo



$\Rightarrow 0.5\left[x\left(\frac{t}{0.5} + 1\right) + x\left(\frac{-t}{0.5} + 1\right)\right]$



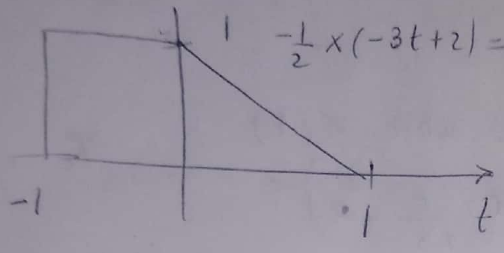
$$x_s(t) = 1.5\left[x\left(\frac{t}{1.5} + 1\right) + x\left(-\frac{t}{1.5} + 1\right)\right] - 0.5\left[x\left(\frac{t}{0.5} + 1\right) + x\left(-\frac{t}{0.5} + 1\right)\right]$$

1.5.8. Considere la señal $-\frac{1}{2}x(-3t+2)$

a) determine y bosqueje la señal original $x(t)$

b) Determine y bosqueje la parte par de $x(t)$

c). Determine y bosqueje la parte impar de $x(t)$.



a).

$y(t) = -\frac{1}{2}x(-3t+2) \Rightarrow -2y(t) = x(-3t+2)$

$x_1(t) = -2y(t) = x(-3t+2)$

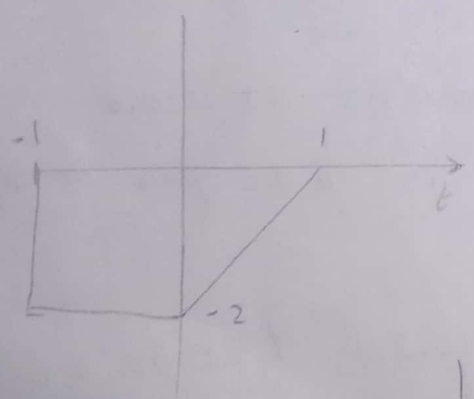
$x_2(t) = -2y(-\frac{t}{3}) = x(-\frac{3t}{-3}+2) = x(t+2)$

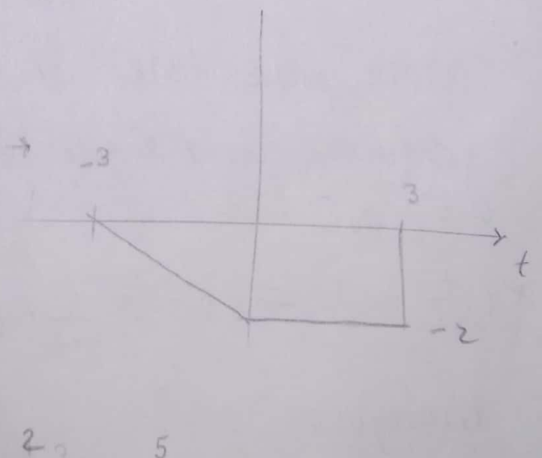
$x_3(t) = x(t-2)$

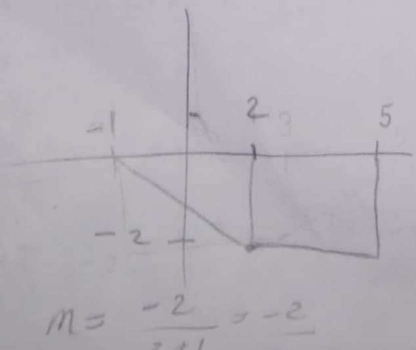
$= x(t-2+2) = x(t)$

$-2y(t) = x(-3t+2)$

$-2\,y(-\frac{1}{3}(t-2)) = x(t)$







$x(t) = -\frac{2}{3}(t+1)[u(t+1) - u(t-2)]$
$-2[u(t-2) - u(t-5)]$

$m = \frac{-2}{2+1} = \frac{-2}{3}$

$x = -\frac{2}{3}(t+1)$

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$$x(t) = -2y\left(-\frac{1}{3}(t-2)\right)$$

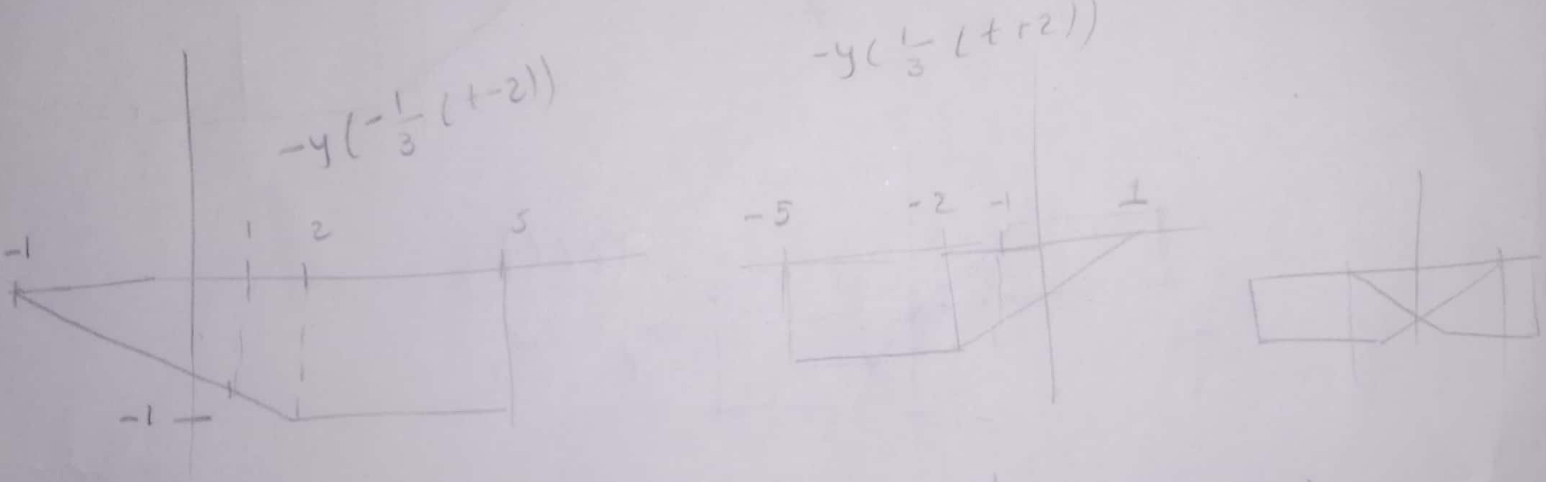
$$x(t) = -\frac{2}{3}(t+1)\left[u(t+1) - u(t-2)\right] - 2\left[u(t-2) - u(t-5)\right]$$

b. Parte par

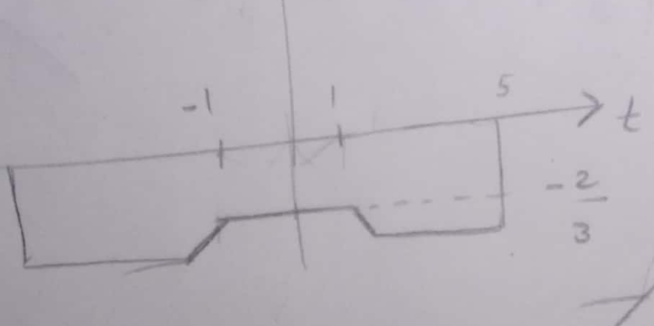
$$x_p = \frac{1}{2}\left(x(t) + x(-t)\right)$$

$$= \frac{1}{2}\left[-2y\left(-\frac{1}{3}(t-2)\right) + \left(-2y\left(\frac{1}{3}(t+2)\right)\right)\right]$$

$$x_p = -y\left(-\frac{1}{3}(t-2)\right) - y\left(\frac{1}{3}(t+2)\right)$$



$$x_p(t) = -y\left(-\frac{1}{3}(t-2)\right) - y\left(\frac{1}{3}(t+2)\right)$$



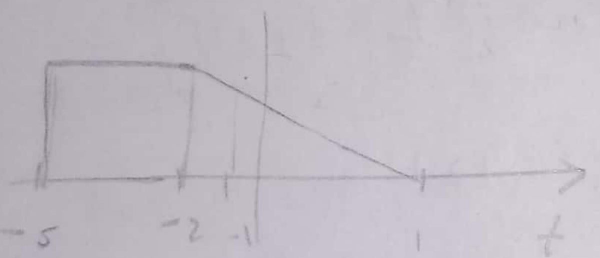
c.)

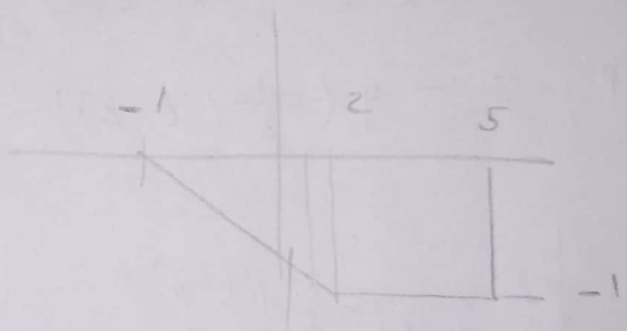
Para parte impar.

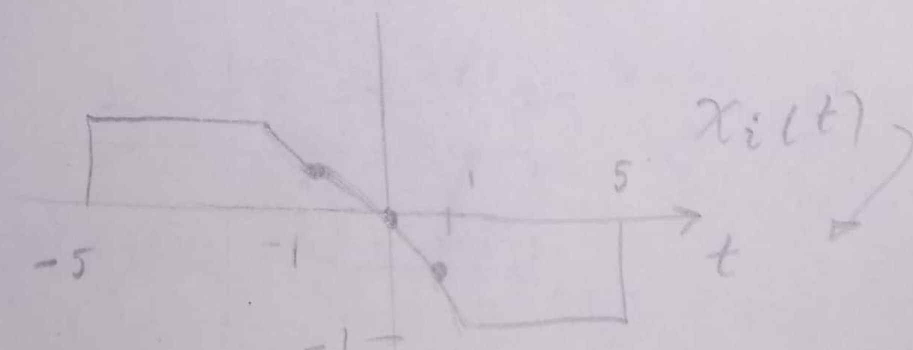
$$x_i(t) = \frac{1}{2}\left(x(t) - x(-t)\right)$$

$$= \frac{1}{2}\left(-2\,y\left(-\frac{1}{3}(t-2)\right) - \left(-2y\left(\frac{1}{3}(t+2)\right)\right)\right)$$

$$= \quad y\left(\frac{1}{3}(t+2)\right) - y\left(-\frac{1}{3}(t-2)\right)$$







$$x_i(t) = y\left(\frac{1}{3}(t+2)\right) - y\left(-\frac{1}{3}(t-2)\right)$$