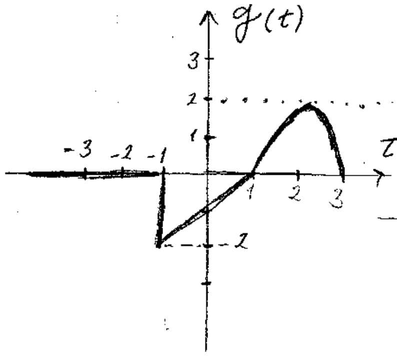
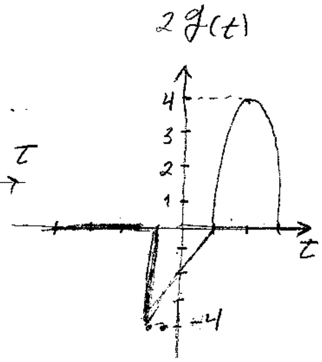
TRANSFORMACIONES DE ESCALAMIENTO Y DESPLAZAMIENTO EN TIEMPO CONTINUO

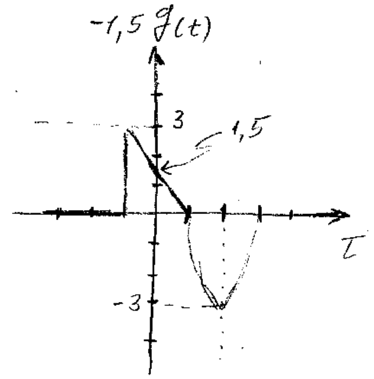
1) ESCALAMIENTO DE AMPLITUD:

$$g(t) \rightarrow A\,g(t)$$

SE MULTIPLICA POR A LA MAGNITUD DE $g(t)$.





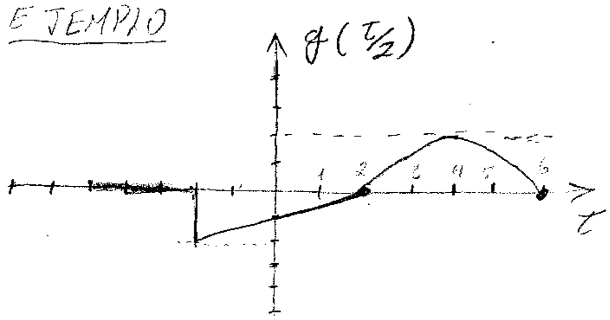


2) ESCALAMIENTO EN EL TIEMPO

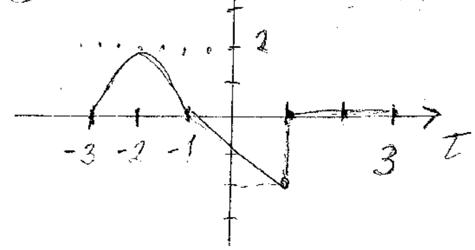
LA TRANSFORMACIÓN FUNCIONAL ES:

$$g(t) \rightarrow \begin{cases} g(t/a) \Rightarrow \text{SE MULTIPLICA POR "a" LA ESCALA DEL TIEMPO} \\ g(at) \Rightarrow \text{SE DIVIDE POR "a" EL TIEMPO} \end{cases}$$

EJEMPLO



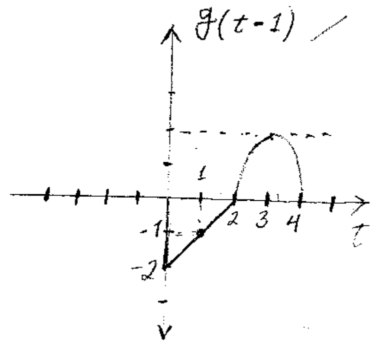
3) REFLEXIÓN

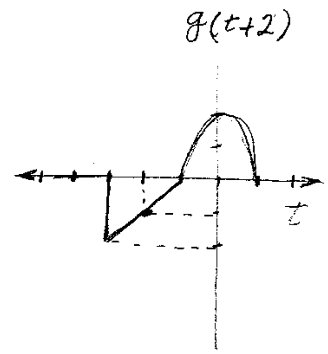


"SE INVIERTE LA GRAFICA"

4) DESPLAZAMIENTO EN EL TIEMPO.

$$g(t) \rightarrow \begin{cases} g(t-t_0) \Rightarrow \text{HACIA LA DERECHA} \\ g(t+t_0) \Rightarrow \text{HACIA LA IZQUIERDA} \end{cases}$$



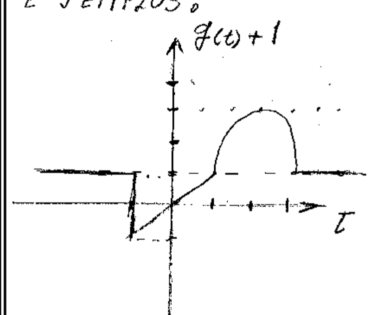


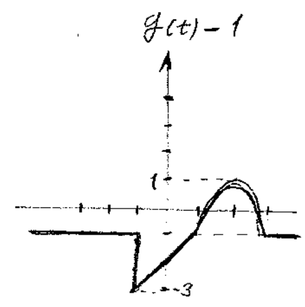
5) DESPLAZAMIENTO EN MAGNITUD

$$g(t) \rightarrow g(t) + a$$

SE DESPLAZA $g(t)$ HACIA ARRIBA EN TANTAS "a" UNIDADES.

EJEMPLOS:





EJEMPLO 1

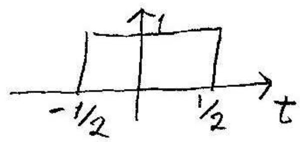
REALICE LA GRAFICA DE:

$$x_{(t)} = \frac{1}{2} \operatorname{rect}\left(\frac{t-2}{2}\right)$$

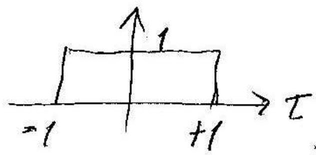
Solución:

$$\operatorname{rect}(t) \Rightarrow \operatorname{rect}\left(\frac{t}{2}\right) \Rightarrow \operatorname{rect}\left(\frac{t-2}{2}\right)$$

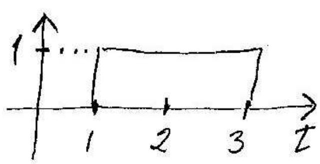
• - $\operatorname{rect}(t) \Rightarrow$



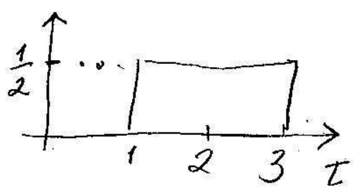
• - $\operatorname{rect}\left(\frac{t}{2}\right) \Rightarrow$



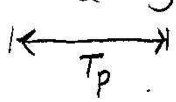
• - $\operatorname{rect}\left(\frac{t-2}{2}\right) \Rightarrow$



• - $\frac{1}{2} \operatorname{rect}\left(\frac{t-2}{2}\right)$



OBSERVE QUE:



$$A = b \times h = \frac{1}{2} \times 2 = 1$$

ESTA FUNCIÓN SE LE CONOCE COMO PULSO UNITARIO DESPLAZADO. SU FORMA GENERAL ES:

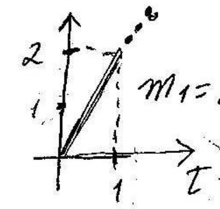
$$X_{(t)} = \frac{1}{T_p} \operatorname{rect}\left(\frac{t - \tau_0}{T_p}\right)$$

EJEMPLO 2

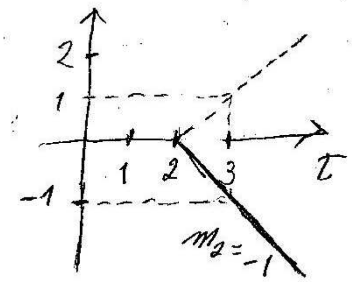
OBTENGA LA GRAFICA DE

$$y_{(t)} = 2\operatorname{ramp}(t) - \operatorname{ramp}(t-2) - 2\operatorname{ramp}(t-3)$$

$*\ 2\operatorname{ramp}(t)$

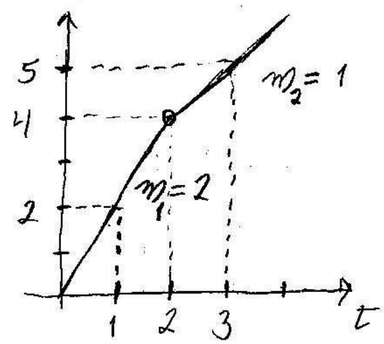


$*\ -\operatorname{ramp}(t-2)$



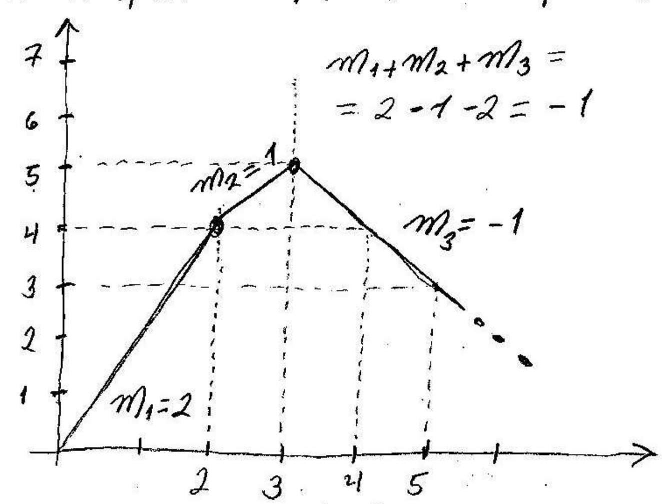
ENTONCES:

$*\ 2\operatorname{ramp}(t) - \operatorname{ramp}(t-2)$



POR LO TANTO

$*\ 2\operatorname{ramp}(t) - \operatorname{ramp}(t-2) - 2\operatorname{ramp}(t-3)$



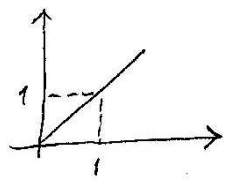
$$m_1 + m_2 + m_3 = 2 - 1 - 2 = -1$$

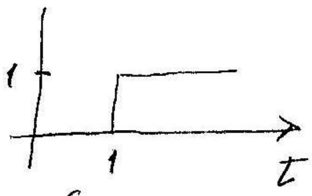
Prof. Ander Miranda

EJEMPLO 3

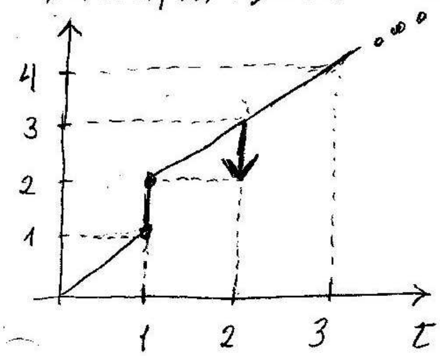
$$Y_{(t)} = r\mathrm{amp}(t) + \mu(t-1) - \delta(t-2)$$

* $r\mathrm{amp}(t)$ * $\mu(t-1)$





* $r\mathrm{amp}(t) + \mu(t) - \delta(t-2)$



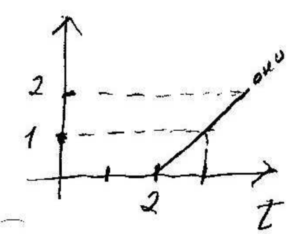
EJEMPLO 4

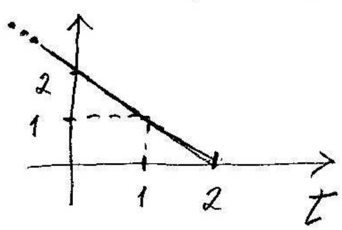
OBTENGA LA GRAFICA DE:

$$X_{(t)} = r\mathrm{amp}(2-t)$$

$$X_{(t)} = r\mathrm{amp}(-(t-2))$$

* $r\mathrm{amp}(t-2)$ * $r\mathrm{amp}(-(t-2))$





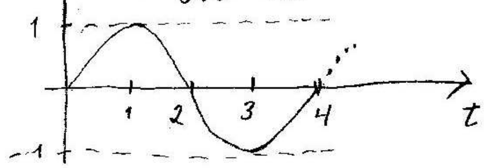
EJEMPLO 5

OBTENGA LA GRAFICA DE:

$$Y_{(t)} = 2e^{-t} \cdot \mathrm{Sen}\,\frac{\pi}{2}t \cdot \mu(t)$$

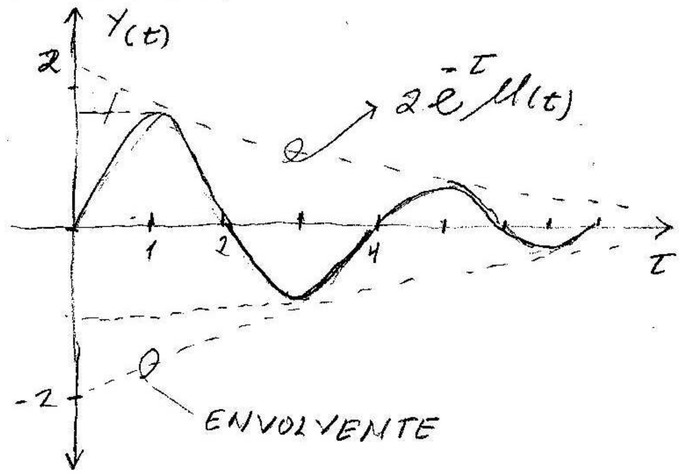
$$T = \frac{2\pi}{\omega} = \frac{2\pi}{\frac{\pi}{2}} = 4\ \mathrm{Seg}$$

$\mathrm{Sen}(\frac{\pi}{2})\mu(t)$



$2e^{-t}\mu(t)$

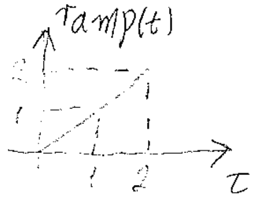
ENTONCES:

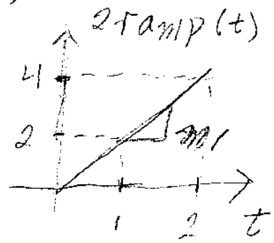


EJEMPLO 2

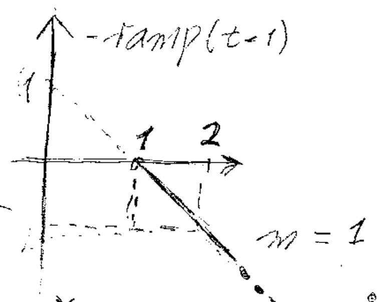
OBTENGA LA GRAFICA DE:

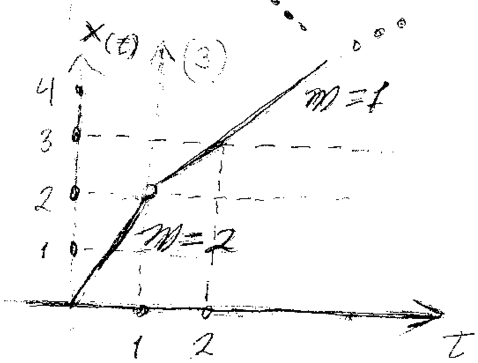
$$x_{(t)} = 2\,ramp(t) - ramp(t-1) + 3\,\delta(t-1)$$





$$m_1 = \frac{4}{2} = 2 \Rightarrow$$



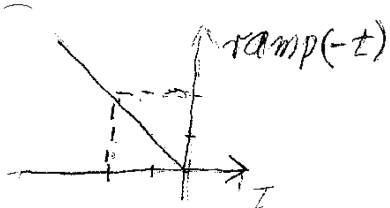


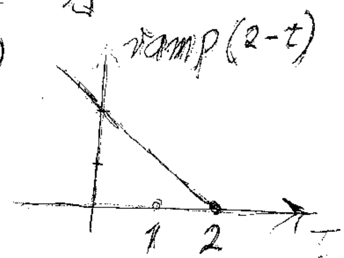
EJEMPLO 1

OBTENGA LA GRAFICA DE:

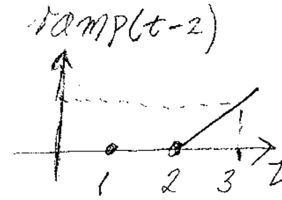
$$X_{(t)} = ramp(2-t) \Rightarrow$$

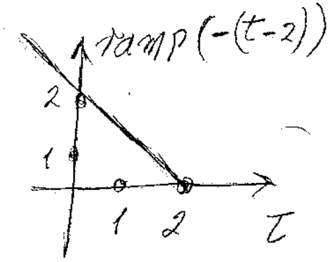
$$X_{(t)} = ramp[-(t-2)]$$



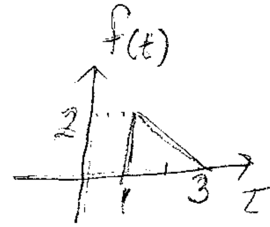


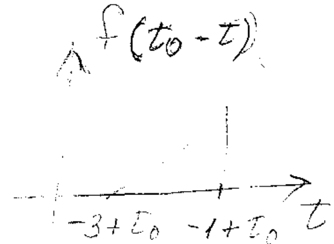
OTRA FORMA:





CONCLUSIÓN





"SE REFLEXIONA Y SE DESPLAZA t_0 UNIDADES A LA DERECHA.

EJERCICIOS: OBTENGA LAS GRAFICAS:

1) $\left[-3\,Sen\,\frac{3\pi}{2}(t-2) - 2\right]$ ...

2) $X_{(t)} = ramp(t)\,Sen\left(\frac{\pi}{2}t\right)\cdot \mu(2-t)$

3) $X_{(t)} = -2\,rect(4t-2)$

4) $X_{(t)} = ramp(t) - 2\,ramp(t-2) + ramp(t-3) + \delta(t)$

5) $X_{(t)} = 3\,e^{-2t}\,rect\left(\frac{t+4}{8}\right)$

6) APROXIME LA SIG GRÁFICA COMO UNA SUMA DE PULSOS, CUYO $T_p = 1$