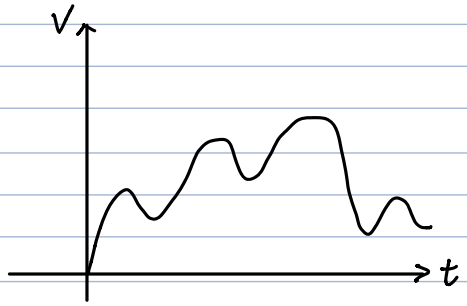
Signal: A function of one or more independent variables that often carries some info.



e.g. speech signals

avg. price of oil on each day.

Aircraft attitude.

The independent variable is often referred to as time.

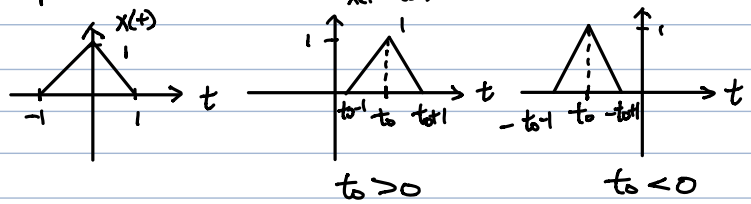
Depending on the nature of indep. variable: signals

- Real indep. variables.
  - continuous time
    - one dimension
    - multi-dimension.
  - discrete time. (integer indep. variables.)
    - one dimension
    - multi-dimension.

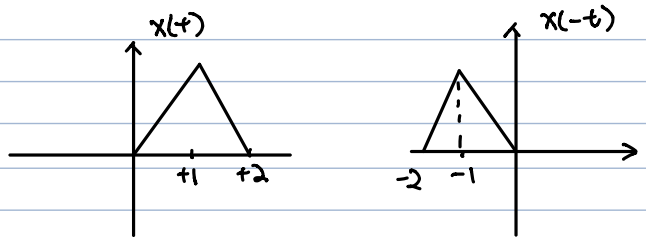
Basic signal properties & transformations.

- Transformation of the indep variables.

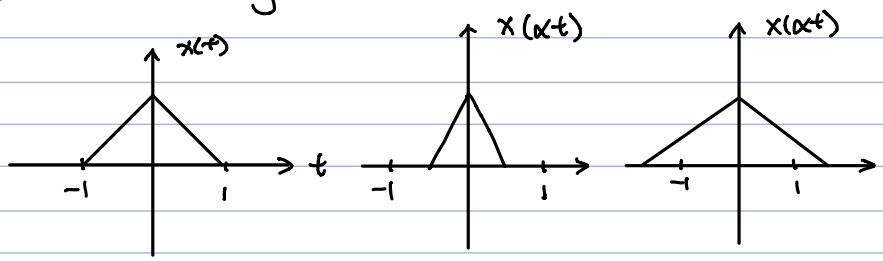
① Time shift.



② Time reversal.



③ Time scaling.

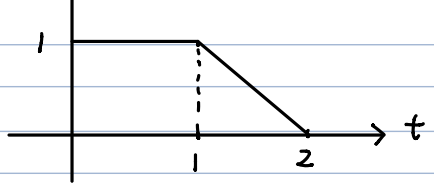


$\alpha > 1$ "signal compressed"

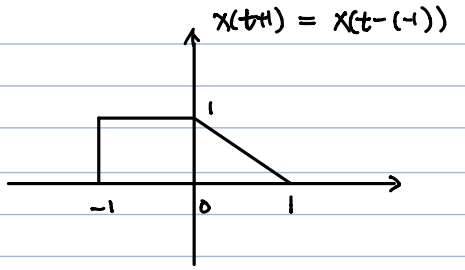
$0 < \alpha < 1$ "signal stretched"

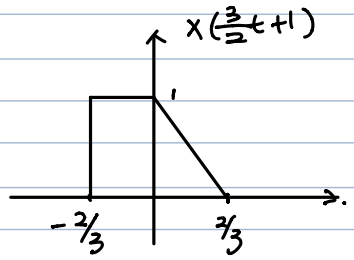
Example:

↑ x(t)



Find. $x(\frac{3}{2}t+1)$ & $x(-t+1)$





A more mathmatical approach.:

$$x(t) = \begin{cases} 0 & t<0 \\ 1 & 0<t<1 \\ -t+2 & 1<t<2 \\ 0 & t>2 \end{cases} \Rightarrow x(\tfrac{3}{2}t+1) = \begin{cases} 0 & \frac{3}{2}t+1<0 \\ 1 & 0<\frac{3}{2}t+1<1 \\ -(\frac{3}{2}t+1)+2 & 1<\frac{3}{2}t+1<2 \\ 0 & \frac{3}{2}t+1>2 \end{cases}$$

$$\Rightarrow x(\tfrac{3}{2}t+1) = \begin{cases} 0 & t<-\frac{2}{3} \\ 1 & -\frac{2}{3}<t<0 \\ -\frac{3}{2}t+1 & 0<t<\frac{2}{3} \\ 0 & t>\frac{2}{3} \end{cases}$$