

∴ ASSIGNMENT #1 SOLUTION ∴

SIGNAL & SYSTEMS

Q#1:- Determine whether or not each of the following signals is periodic. If a signal is periodic, specify its fundamental period.

1)  $x[n] = e^{j\frac{4}{\pi}n}$

Sol:-

$$\omega_0 = \frac{4}{\pi}$$

$$\frac{N}{m} \frac{2\pi}{\omega_0} = \frac{2\pi}{4 \times 2} \times \pi \Rightarrow \frac{\pi^2}{2}$$

As the ratio is not rational, hence the signal  $x[n]$  is Aperiodic.

2)  $x[n] = \sin\left[\frac{6\pi}{7}n + 1\right]$

Sol:-

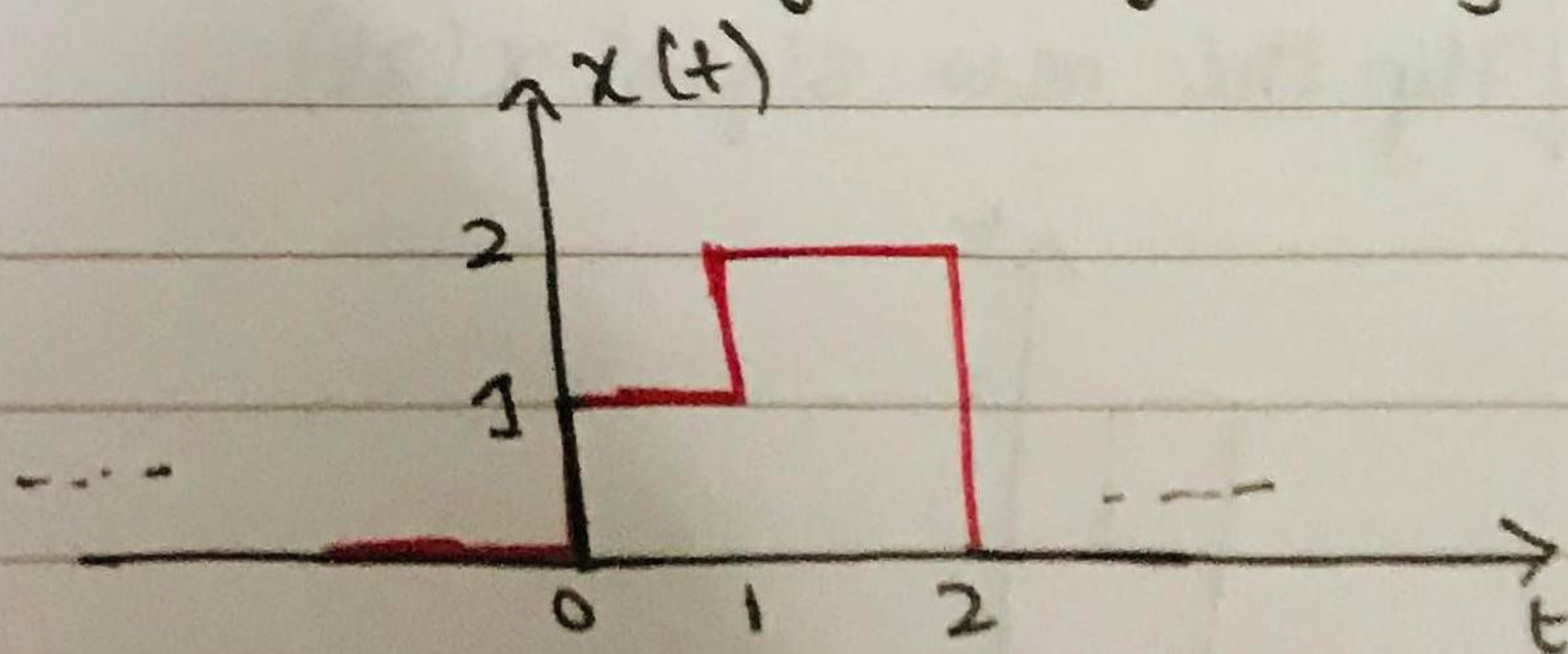
$$\omega_0 = \frac{6\pi}{7}$$

$$\frac{N}{m} = \frac{2\pi}{\omega_0}$$

$$= \frac{2\pi}{6\pi/7} = \frac{2\pi}{3\pi} \times 7 \Rightarrow \frac{7}{3}$$

$N \Rightarrow 7$  is the fundamental period of  $x[n]$ .

Q#2:- Sketch and label each of the following signal.



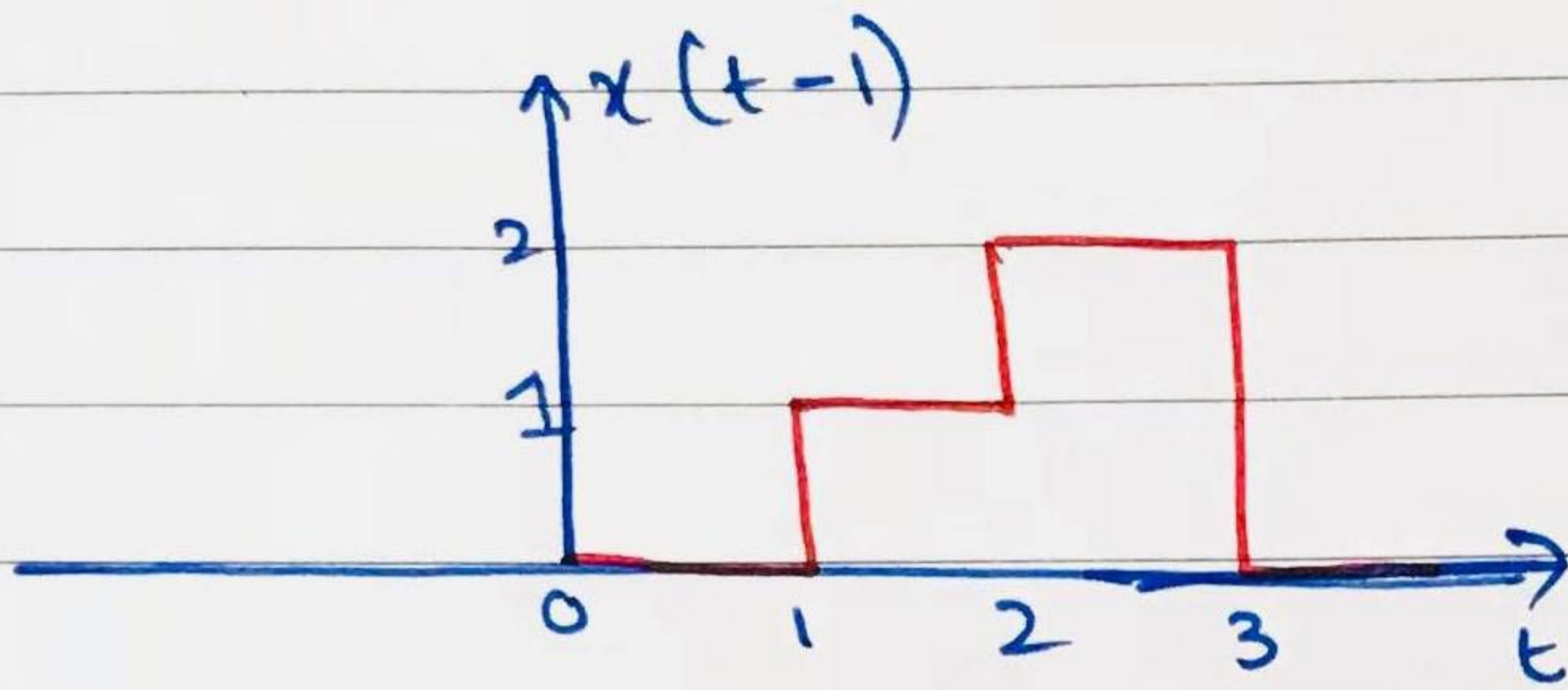
1)  $x(t-1)$ .

Sol:

Shift the given signal by  $T_0 = 1$  point to the right.

$$x(t) = x(t - T_0)$$

$$T_0 = 1$$



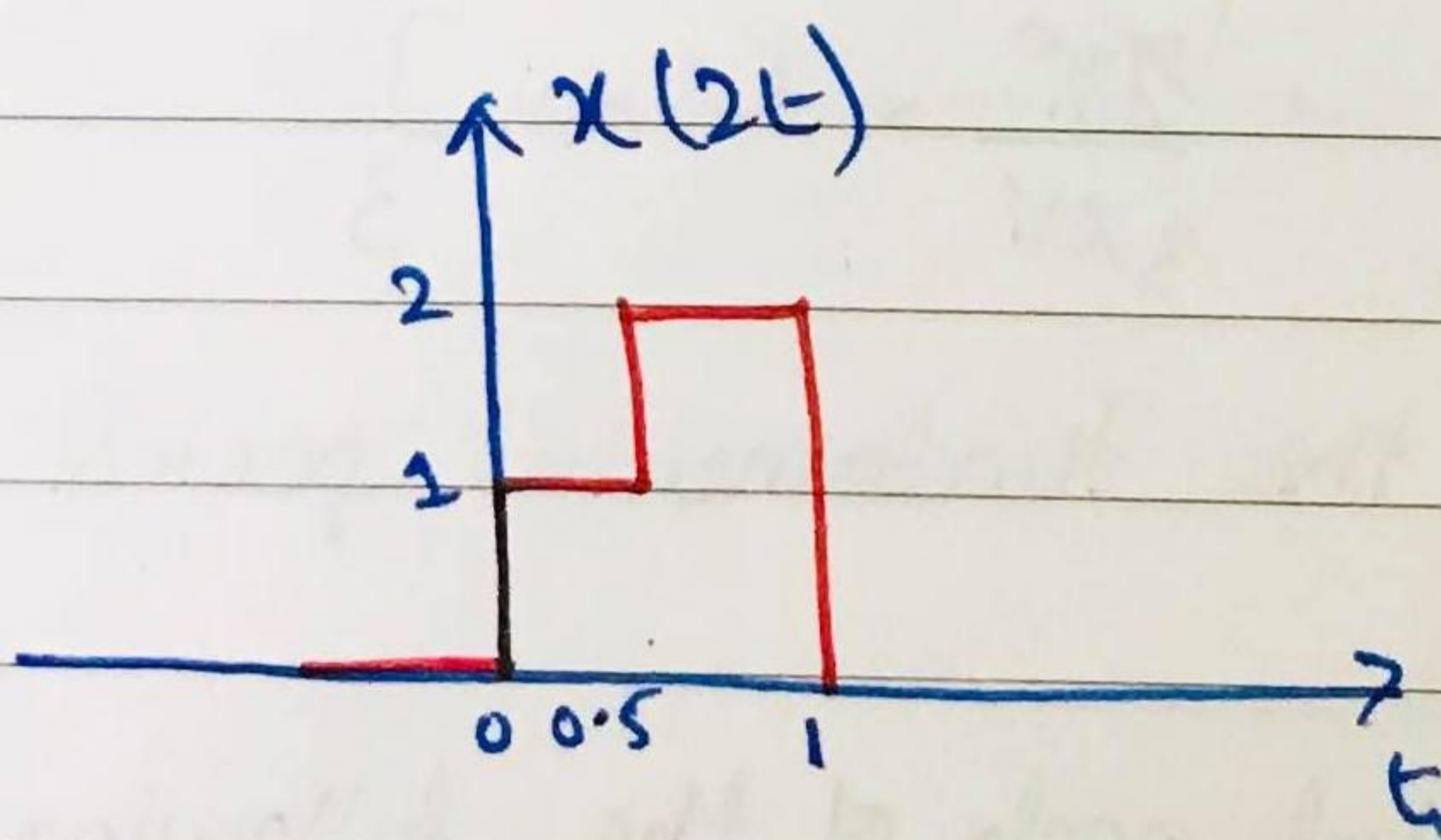
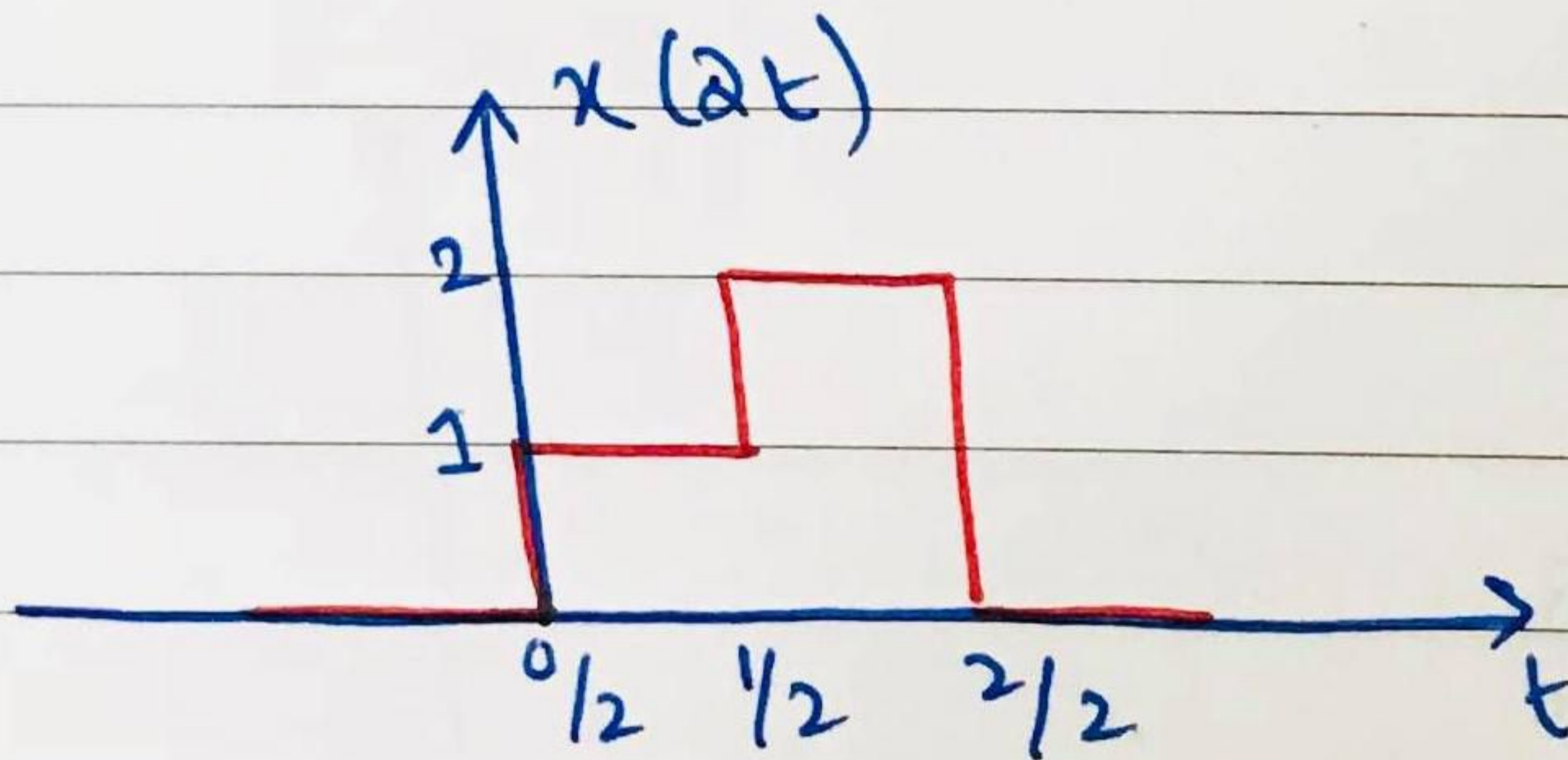
2)  $x(-2t)$

Sol:

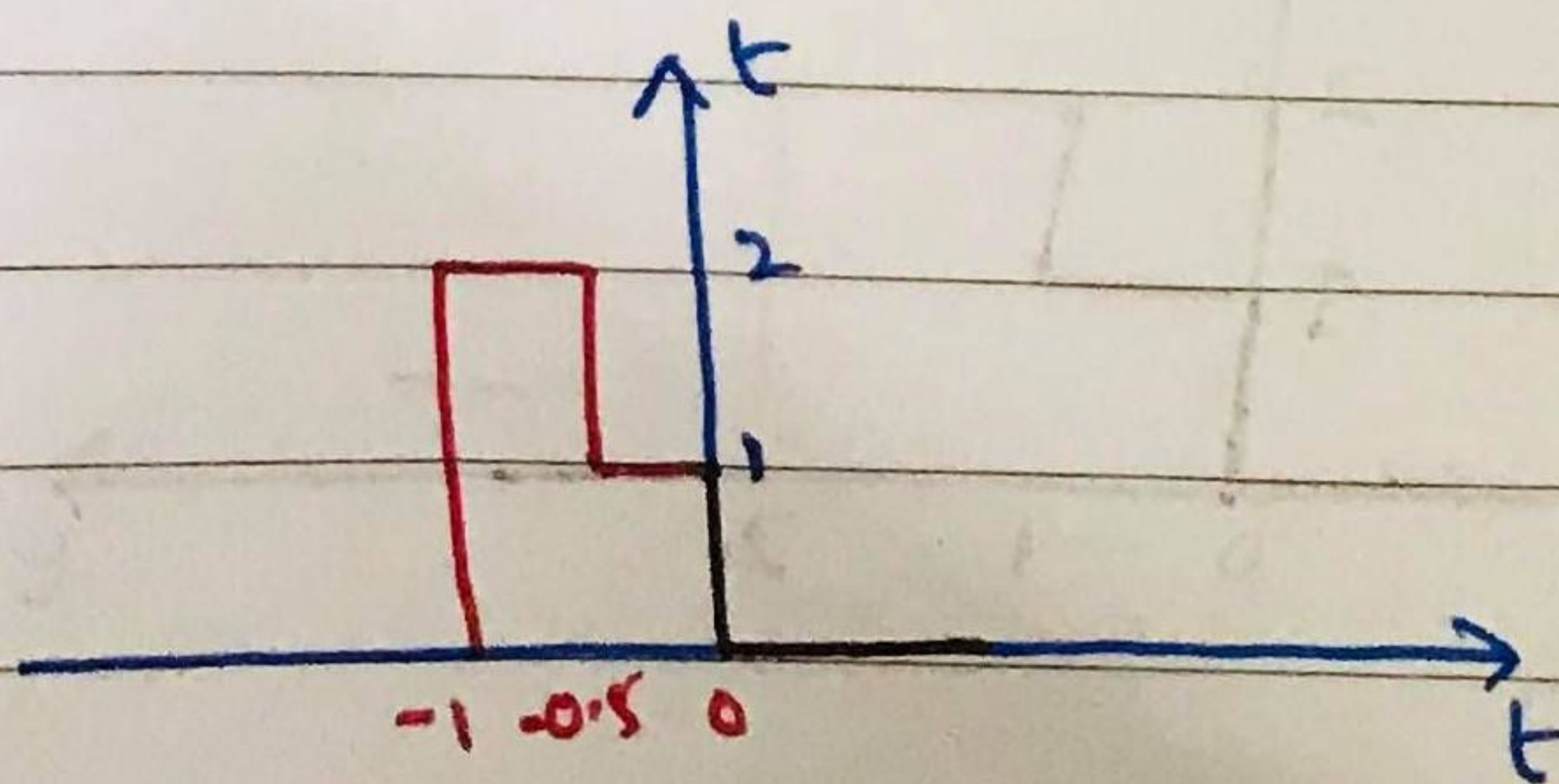
First scale the given signal by 2.

$$x(t) = x(dt)$$

$$d = 2$$



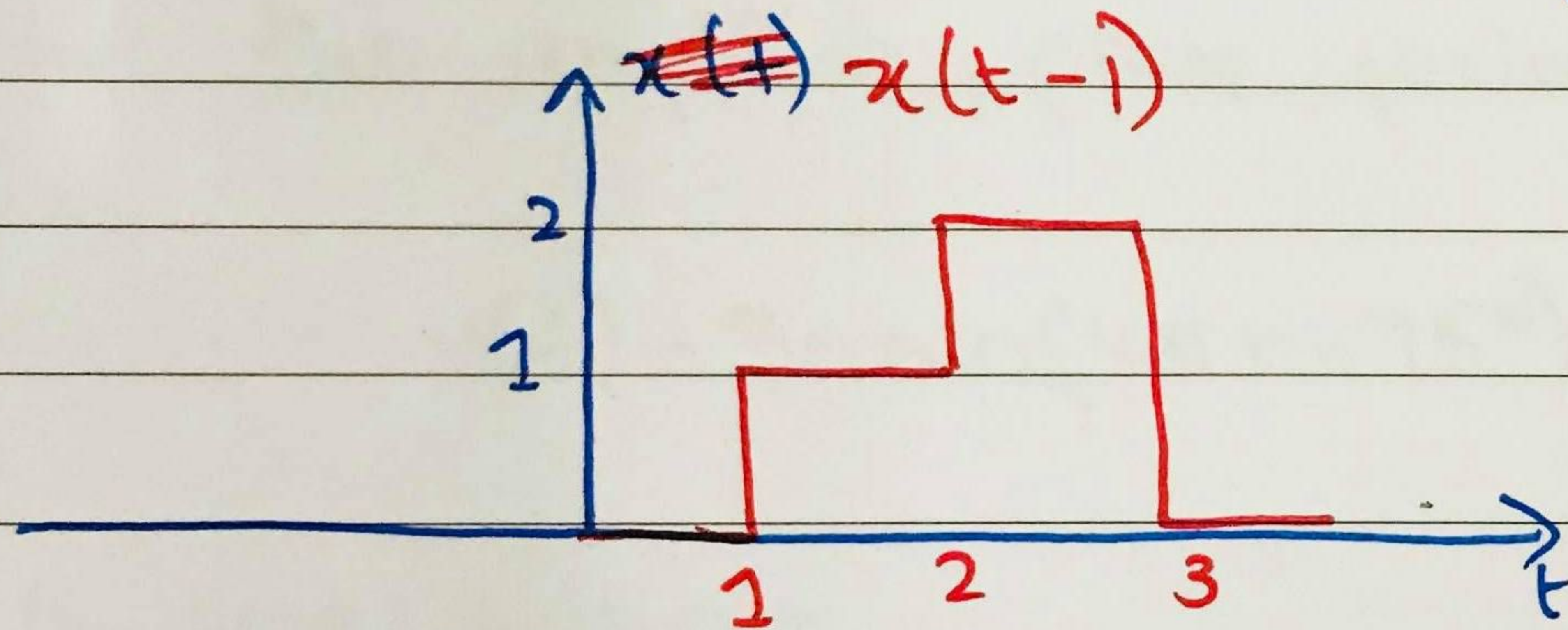
Now reverse / flip the new signal  $x(2t)$



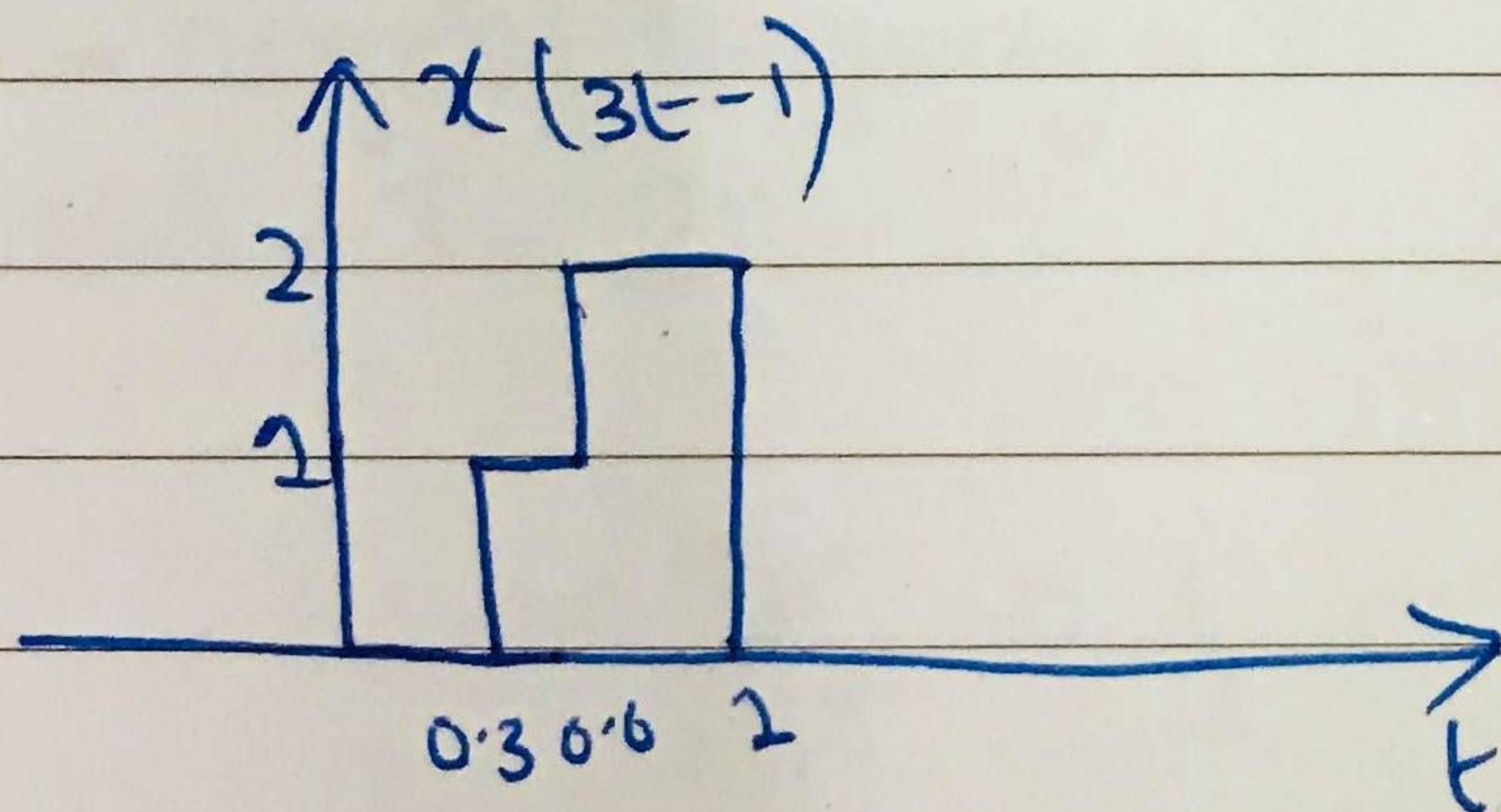
$$3)x(3t-1)$$

Solve

$x(t) = x(t - T_0)$ ,  $T_0 = 1$  shift 1 point towards right



Now scale by 3.



$$1/3 \Rightarrow 0.333$$

$$2/3 \Rightarrow 0.666$$

$$3/3 = 1$$