

Paper 3C1  
**Examples Sheet 2: Signals and Systems**

1. Sketch for  $t \in [-8; 8]$  and label carefully the following transformations of the signal shown on the left in figure 1.

- (a)  $x(t - 1)$
- (b)  $x(3 - t)$
- (c)  $x(2t)$
- (d)  $x(t + 2) u(t)$

2. Sketch for  $n \in [-8 : 8]$  and label carefully the following transformations of the signal shown on the right in figure 1.

- (a)  $x_{n-3}$
- (b)  $x_{2-n}$
- (c)  $x_{2n}$
- (d)  $x_{n+2} u_{n-2}$

3. Write down mathematical expressions for the various step, impulse and ramp signals shown in figure 2.

4. What is a Linear Time Invariant (LTI) system? Consider an LTI system whose response to the signal  $x(t)$  in figure 3 is  $y(t)$  as shown. Determine and sketch the response of the same system to the input signals  $a(t)$  and  $b(t)$  also shown in that figure.

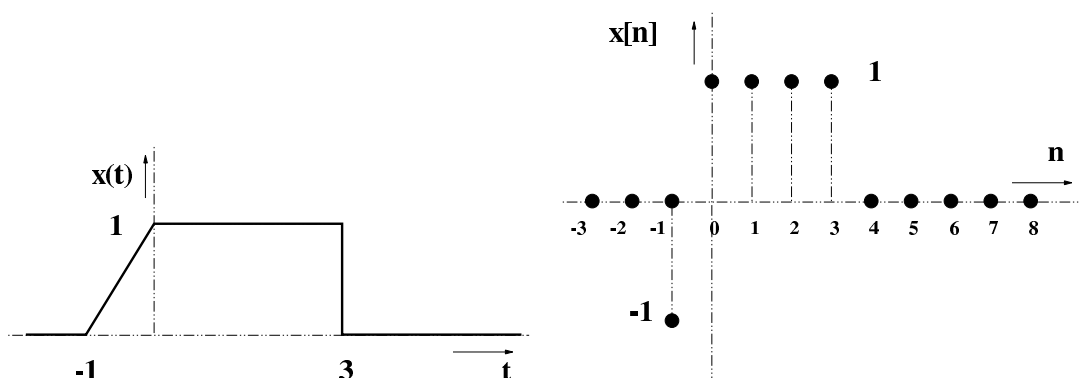


Figure 1: Signals for questions 1 and 2.

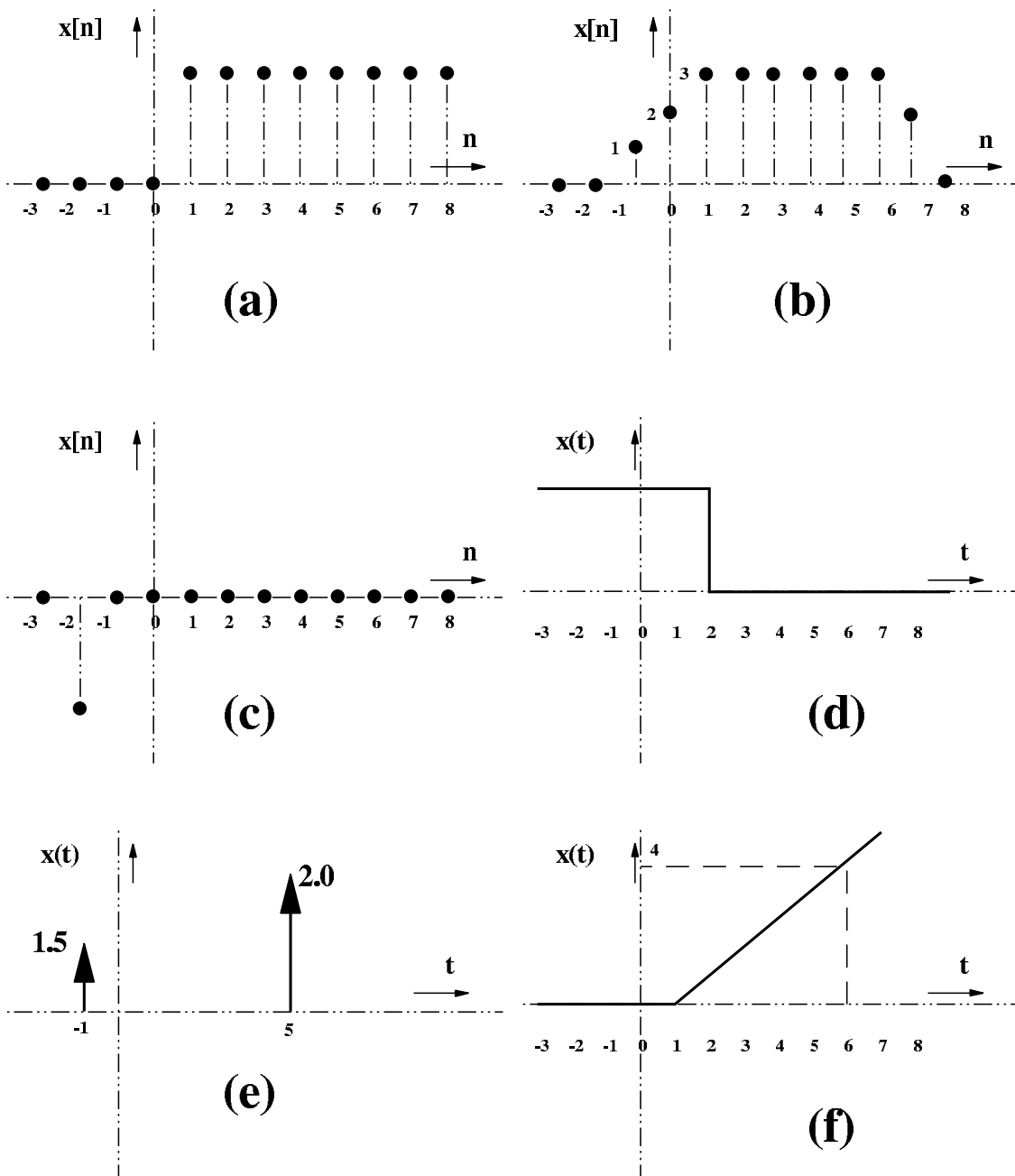


Figure 2: Signals for question 3.

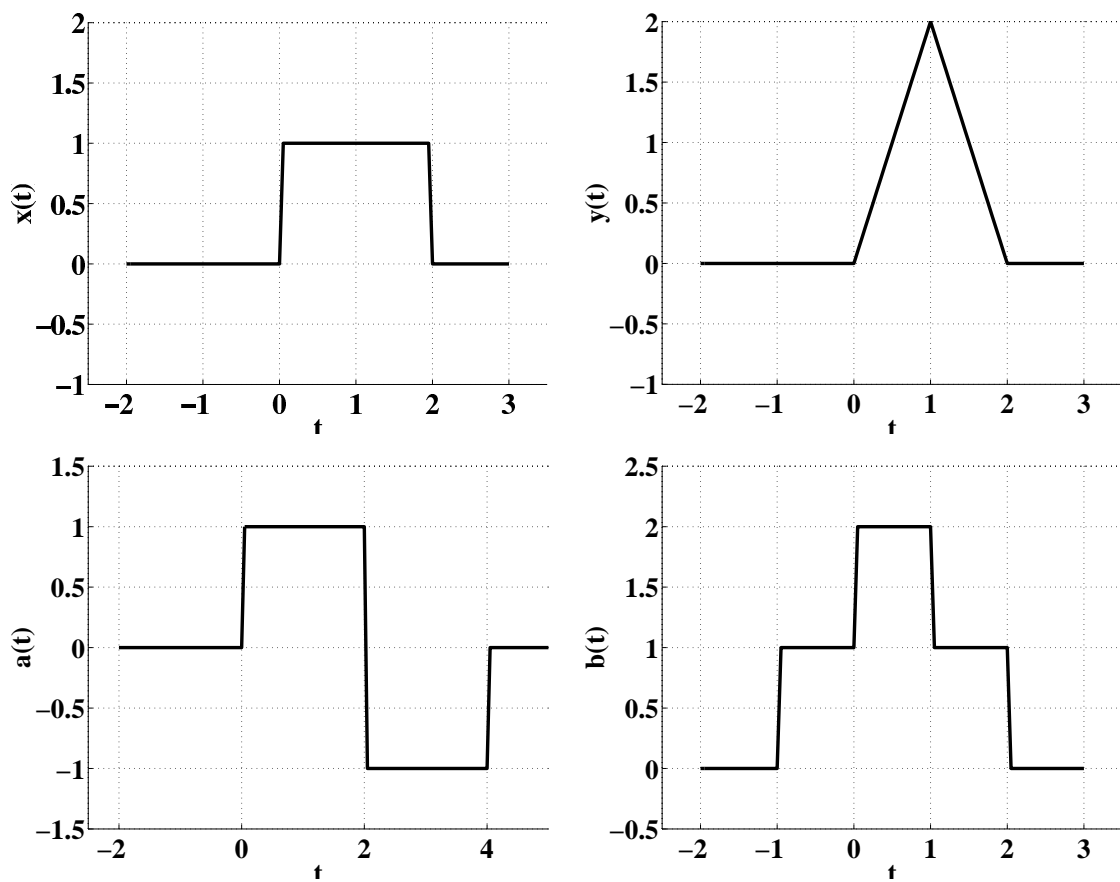


Figure 3: Signals for question 4.