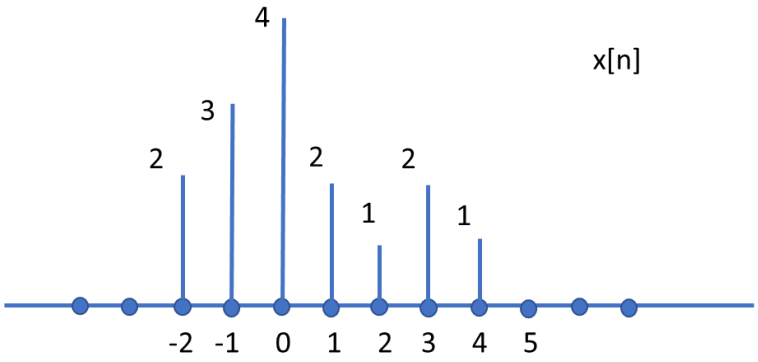
Discrete time systems and z-transform

Exercises module 1

1. Show that $u[n] = \sum_{k=0}^{\infty} \delta[n-k]$.

2. Given the discrete time signal x[n] shown below:



- Express the signal as a sum of impulses.
- Sketch and label the following signals:
  - x[n-2]
  - x[1-n]
  - x[n]u[2-n]
  - x[n-1]δ[n-3]

3. Determine whether each of the following system is linear, causal, stable and time invariant:

- $T(x[n]) = e^{x[n]}$
- $T(x[n]) = ax[n] + b$, with finite *a*,*b*
- $T(x[n]) = x[-n]$
- $T(x[n]) = x[n] + u[n+1]$
- $T(x[n]) = \sum_{k=n-1}^{n+1} x[k]$
- $T(x[n]) = x[n^2]$