1.6 Problems

1. Consider the following sequences:

$$\begin{aligned} x[n] &= \{-4, 5, 1, -2, -3, 0, 2\}, -3 \leq n \leq 3 \\ y[n] &= \{6, -3, -1, 0, 8, 7, -2\}, -1 \leq n \leq 5 \\ w[n] &= \{3, 2, 2, -1, 0, -2, 5\}, 2 \leq n \leq 8. \end{aligned}$$

   The sample values of each of the above sequences outside the ranges specified are all zeros. Generate the following sequences:

   (a) $c[n] = x[-n+2]$.

   (b) $d[n] = y[-n-3]$.

   (c) $e[n] = w[-n]$.

   (d) $f[n] = x[n] + y[n-2]$.

   (e) $v[n] = x[n] \cdot w[n+4]$.

   (f) $s[n] = y[n] - w[n+4]$.

   (g) $r[n] = 3.5y[n]$.

   You may either do these by hand (i.e. with paper-and-pencil) or by using Matlab (in which case, you should turn in your plots and the commands used to generate them).

2. (a) Express the sequences $x[n], y[n]$ and $w[n]$ of Problem 1 as a linear combination of delayed unit sample sequences.

   (b) Express the sequences $x[n], y[n]$ and $w[n]$ of Problem 1 as a linear combination of delayed unit step sequences.

3. Compute the energy of each of the sequences $x[n], y[n]$ and $w[n]$ of Problem 1.

4. Plot each of the following sequences (using a stem diagram):

$$\begin{aligned} x_1[n] &= 3\delta[n+2] + 2\delta[n] - \delta[n-3] + 5\delta[n-7]. \\ x_2[n] &= \sum_{k=-5}^{5} e^{|k|}\delta[n-2k]. \\ x_3[n] &= 10u[n] - 5u[n-5] - 10u[n-10] + 5u[n-15]. \\ x_4[n] &= e^{0.1n}\left(u[n+20] - u[n-10]\right). \end{aligned}$$

   The sample values of each of the above sequences outside the ranges specified are all zeros. *Again, you may either do these by hand (i.e. with paper-and-pencil) or by using Matlab (in which case, you should turn in your plots and the commands used to generate them).*