Practice Problems 01 2024.02.20

1. If x(t) is as shown in Fig. 1, please plot $y_1(t) = x(t - 2)$ and $y_2(t) = x(t + 1)$. (10%)

2. If x(t) is as shown in Fig. 2, please plot $y_1(t) = x(1 – t/2)$ and $y_2(t) = 3x(1 – t/2) – 1$. (20%)

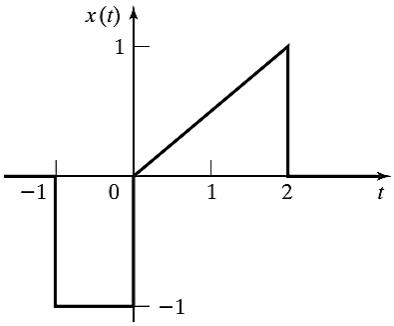

Fig. 1

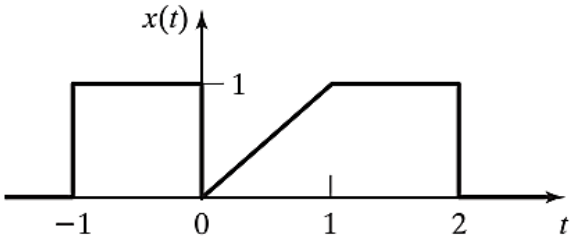

Fig. 2

3. If the discrete signal x[m] is as shown in Fig. 3, please plot $y_1[n] = x[2n]$ and $y_2[n] = x[n/3]$. (10%)
4. If the discrete signal x[n] is as shown in Fig. 4, please plot $y_1[n] = 3 - 2x[n]$ and $y_2[n] = 3 - 2x[2 - n]$. (20%)

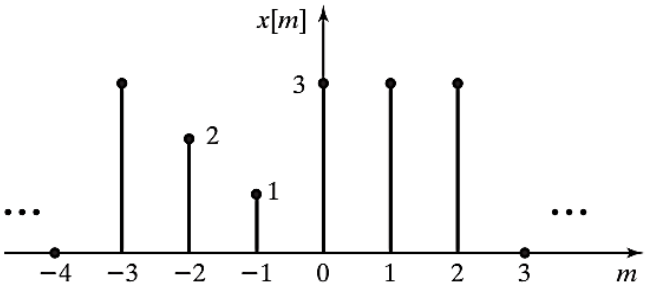

Fig. 3

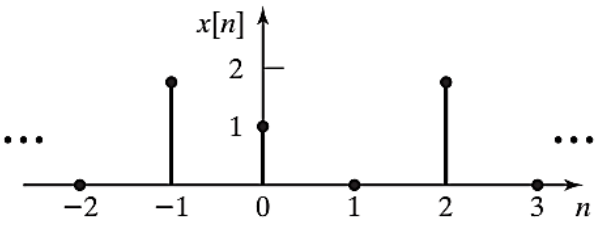

Fig. 4

5. Three periodic signals [$x_1(t) = \cos(3.5t)$, $x_2(t) = \sin(2t)$, and $x_3(t) = 2\cos(7t/6)$] are summed to form v(t). Determine whether v(t) is periodic. If v(t) is periodic, determine the fundamental period of v(t). (10%)

6.1 A continuous-time signal $x(t) = \cos 2\pi t$ is sampled every T seconds, resulting in the discrete-time signal x[n] = x(nT). Determine whether the sampled signal is periodic for (a) T = 1 s, (b) T = 0.1 s, (c) T = 0.125 s, (d) T = 0.130 s, (e) T = 5 s, (f) T = 4/3 s. (10%)

6.2 For those sampled signals in 6.1 that are periodic, find the number of periods of x(t) in one period of x[n]. (10%)

6.3 For those sampled signals in 6.1 that are periodic, find the number of samples per period. (10%)