DSP – Practice Problem Set #1

1. Use the Fourier transform properties to obtain the Fourier transform of the following:

    (a) $x_1(t) = 5 + 3\cos(10t) - 7e^{-2t}\sin(3t)u(t)$;
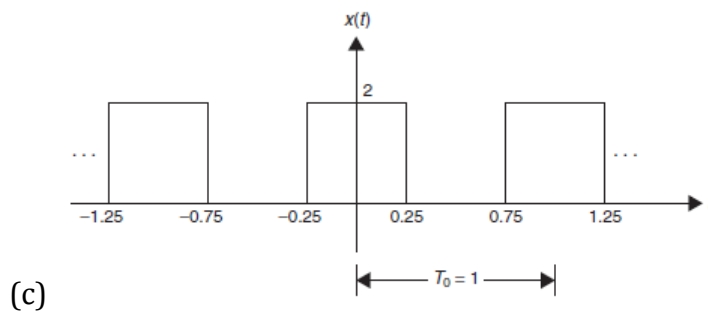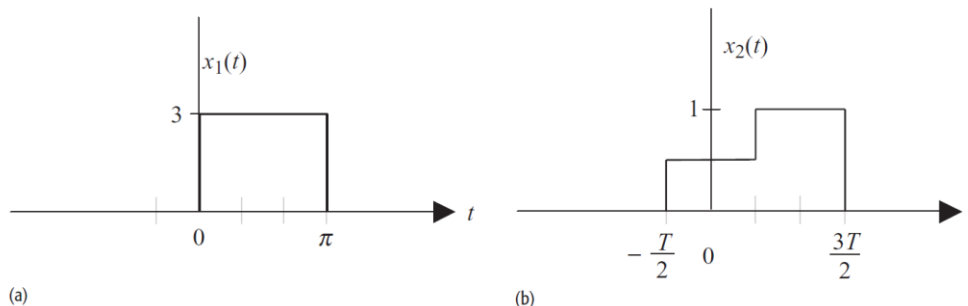
    (b) $x_2(t) = \dfrac{1}{\pi t}$;

    (c) $x_3(t) = t^2 e^{-4|t-5|}$;

    (d) $x_4(t) = 5\dfrac{\sin(3\pi t)\sin(5\pi t)}{t^2}$;

    (e) $x_4(t) = 4\dfrac{\sin(3\pi t)}{t} * \dfrac{d}{dt}\left[\dfrac{\sin(4\pi t)}{t}\right]$.

2. Evaluate the frequency-domain representations of the shown signals:

(a)

(b)

(c)

3. Consider the linear time-invariant systems given as:

    (a) $x(t) = e^{-2t}u(t)$ and $y(t) = 5e^{-2t}u(t)$;

    (b) $x(t) = e^{-2t}u(t)$ and $y(t) = 3e^{-2(t-4)}u(t-4)$;

    (c) $x(t) = e^{-2t}u(t)$ and $y(t) = t^3 e^{-2t}u(t)$;

    (d) $x(t) = e^{-2t}u(t)$ and $y(t) = e^{-t}u(t) + e^{-3t}u(t)$.

For each of the above systems, determine (i) the transfer function H(Ω), (ii) the impulse response function h(t).

Homework: Solve and turn in Problems 1(c), 2(c), 3(d)