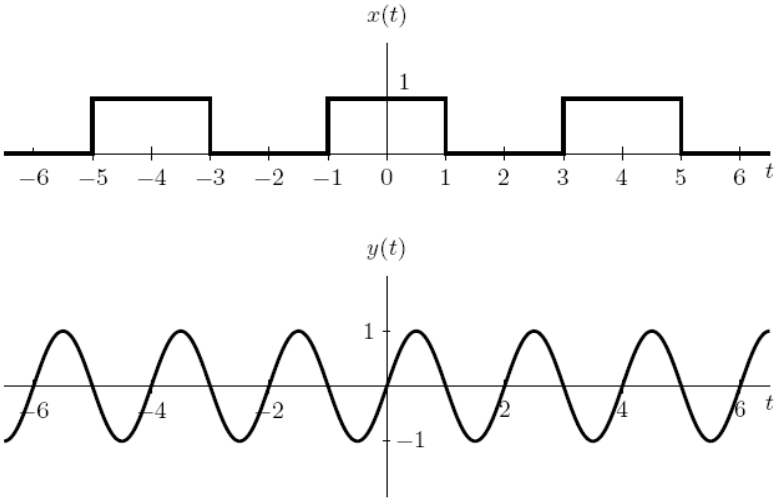
Homework No. 4

Due 18:20, Nov. 15, 2012

1. Consider the following continuous-time periodic signals, $x(t)$, $y(t)$.



(1) Determine the fundamental period, frequency, and Fourier series coefficients a_k for $x(t)$. (10%)

(2) Determine the fundamental period, frequency, and Fourier series coefficients a_k for $y(t)$. (10%)

2. Determine the time-domain signals represented by the following Fourier series coefficients:

(1) $a_k = j\delta[k-1] - j\delta[k+1] + \delta[k-3] + \delta[k+3],\ \omega_0 = 2\pi$. (10%)

(2) $a_k = (\frac{-1}{3})^{|k|},\ \omega_0 = \pi$. (10%)

3. Find the impulse response and the frequency response of the systems with input $x(t)$ and output $y(t)$:

(1) $x(t) = e^{-t}u(t),\ y(t) = \left[e^{-2t} + e^{-3t}\right]u(t)$ (15%)

(2) $x(t) = e^{-2t}u(t),\ y(t) = 2(t-2)e^{-2(t-2)}u(t-2)$ (15%)

4. Use the tables of transforms and properties to find the Fourier transforms or the inverse Fourier transforms of the following signals: (30%)

(1) $x(t) = \sin(2\pi t)e^{-t}u(t)$

(2) $x(t) = \left[\frac{\sin(2\pi t)}{\pi t}\right]\left[\frac{2\sin(3\pi t)}{\pi t}\right]$

(3) $X(\omega) = \frac{j\omega}{(1+j\omega)^2}$