DSP Final-Exam

Name: Number:

1. [5점] 다음의 신호를 그리고, 각각의 f, ω, T를 구하시오.

   (1) $x(t) = 3\cos(2t + 1)$

   (2) $x(t) = 2\cos\left(\pi t + \frac{\pi}{4}\right) + 2$

2. [10점] 다음 함수들의 LTI 여부를 판별하시오.

   (1) $y(t) = x(t^2 - a)$

   (2) $y(t) = 3t^2 x(t)$

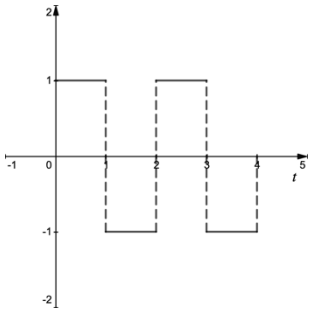
3. [10점] Complex Addition 방법을 이용하여, 다음 cosine들의 합을 하나의 cosine 형태로 나타내시오.

$$x_1(t) = -2\cos\left(7\pi t + \frac{\pi}{2}\right), \quad x_2(t) = 5\cos\left(7\pi t - \frac{3\pi}{2}\right), \quad x_3(t) = 3\sqrt{3}\cos(7\pi t + \pi)$$

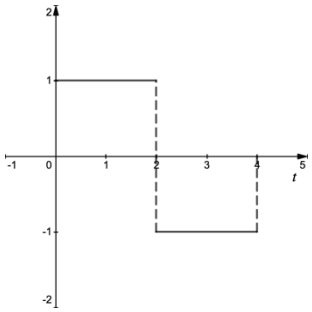
4. [10점] 다음 신호를 graphical spectrum representation으로 나타내시오.

$$x(t) = 5 + 8\sin\left(400\pi t + \frac{\pi}{2}\right) - 2\sin\left(200\pi t - \frac{\pi}{4}\right)$$

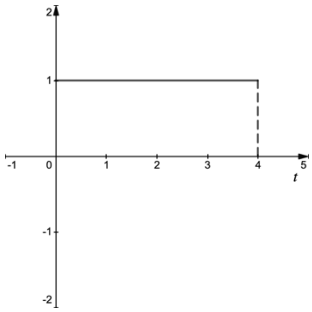
5. [10점] 다음 기저함수들을 이용하여 주어진 함수 $x(t)$를 표시하시오.



$\phi_1(t)$



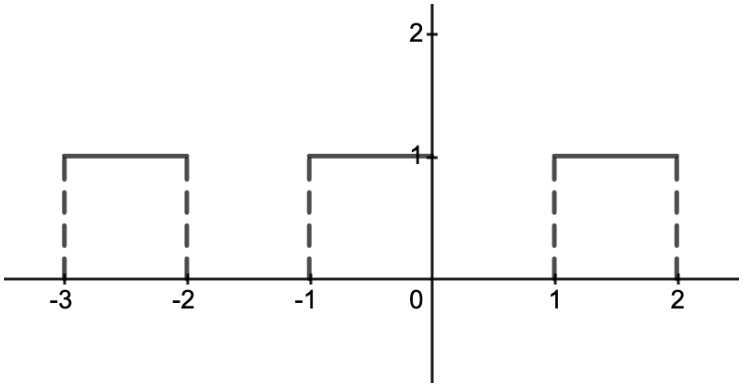
$\phi_2(t)$



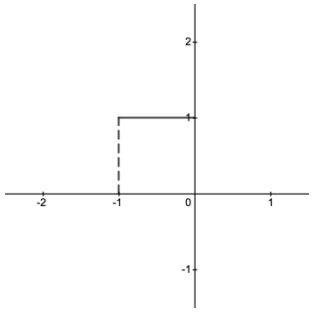
$\phi_3(t)$

$$x(t) = t - 2$$

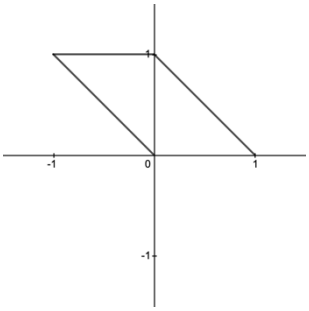
6. [15점] 다음과 같은 주기 신호의 Fourier Coefficients a_k를 구하고, 스펙트럼을 그리시오.



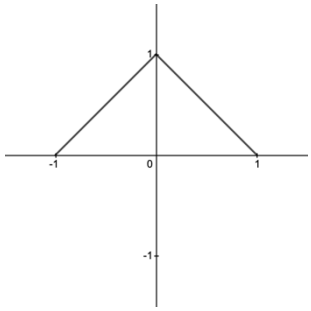
7. [20점] 다음 신호의 Fourier Transform을 구하고, Magnitude Spectrum을 그리시오.



8. [20점] LTI 시스템에서 입력 $x(t)$와 impulse response $h(t)$가 다음과 같이 주어질 때, 출력 $y(t)$를 구하고, 그래프를 그리시오.



$x(t)$



$h(t)$