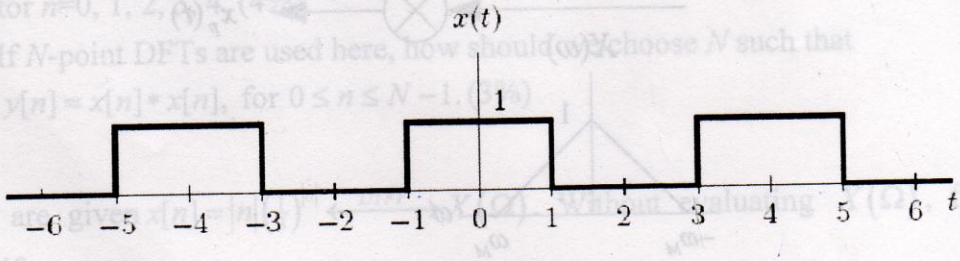
Midterm Exam II

May 19, 2009

Instructor: *Chin-Liang Wang*

1. ***Compute*** and ***sketch*** the Fourier series coefficients of the following signal: (10%)



(Label your axes clearly and carefully!)

2. Determine the output signal of the system $y(t)$ if the impulse response of the system $h(t)=e^{at}u(-t)$ and the input signal $x(t)=e^{bt}u(-t)$ for

(1) $a>0$, $b>0$, and $a\neq b$. (5%)

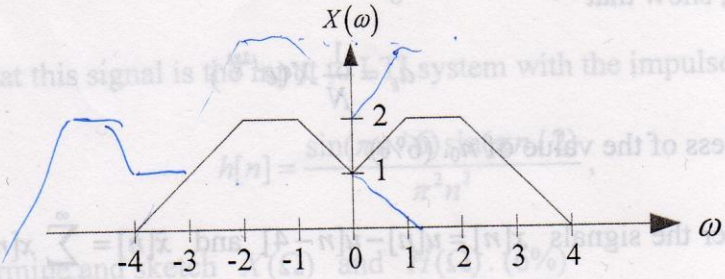
(2) $a>0$, $b>0$, and $a=b$. (5%)

(***Hint:*** $x(t)=e^{-at}u(t),\ a>0 \xleftrightarrow{\mathcal{F}} X(\omega)=\dfrac{1}{a+j\omega}$.)

3. Consider an LTI system with frequency response $H(\omega)=\begin{cases} e^{-j\omega} & |\omega|\le 5 \\ 0 & otherwise \end{cases}$.

Determine the output $y(t)$ if the input is $x(t)=\sum_{k=0}^{\infty}(0.5)^k \sin(2kt)$. (10%)

4. Evaluate the quantities for following signal:



(1) $\int_{-\infty}^{\infty} x(t)\,dt$ (3%) (2) $\int_{-\infty}^{\infty} |x(t)|^2\,dt$ (3%) (3) $\int_{-\infty}^{\infty} x(t)e^{j2t}\,dt$ (3%)

(4) $x(0)$ (3%) (5) $\tan^{-1}\left\{\dfrac{\mathrm{Im}(x(t))}{\mathrm{Re}(x(t))}\right\}$ (3%)