

#1) Refer to HW7 Question 1

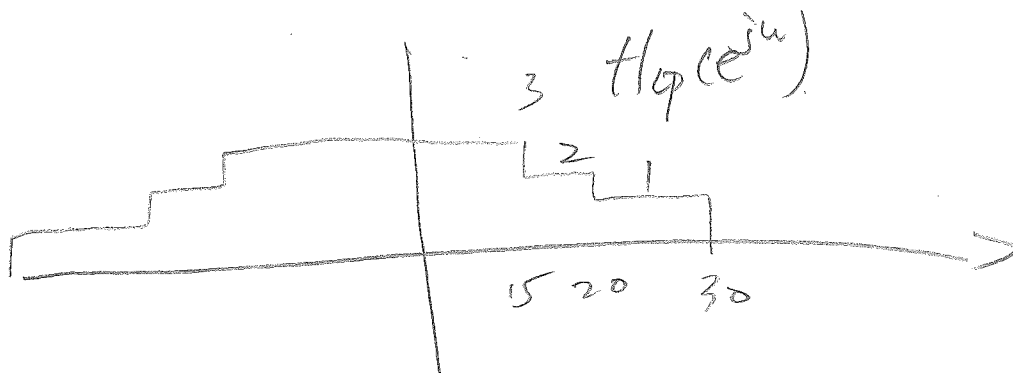
#2) $x[n] = x_a(nT_s)$ where $T_s = \frac{1}{2}$.

a) Since $|nT_s| \leq 2$
 $\Rightarrow n \leq 4$, where 4 is corresponding to N_1 in Table 5.2

thus $X(e^{j\omega}) = \frac{\sin(4.5\omega)}{\sin(\frac{1}{2}\omega)}$

b) $X(e^{j\omega}) = T_s \int \frac{d}{d\omega} \left(\frac{\sin(4.5\omega)}{\sin(\frac{1}{2}\omega)} \right)$

#3) $h_p(t) = \frac{\sin(\pi t)}{\pi t} + \frac{\sin(2\pi t)}{\pi t} + \frac{\sin(3\pi t)}{2}$

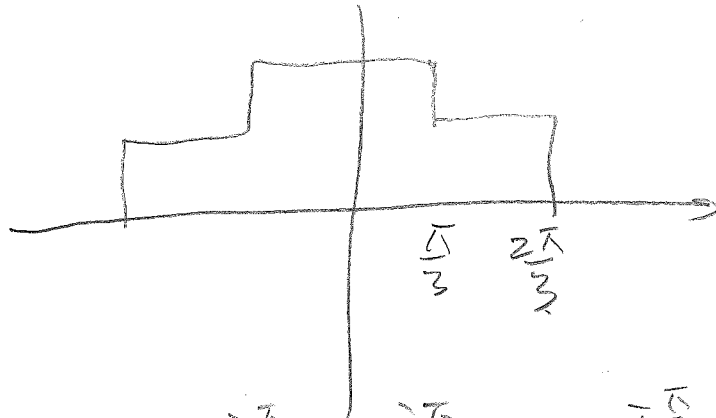


$X(t) = X_0 * h(t)$

$= 3 + 3(e^{j\pi t} + e^{-j\pi t}) + 3(e^{j2\pi t} + e^{-j2\pi t}) + e^{j3\pi t} + e^{-j3\pi t}$

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

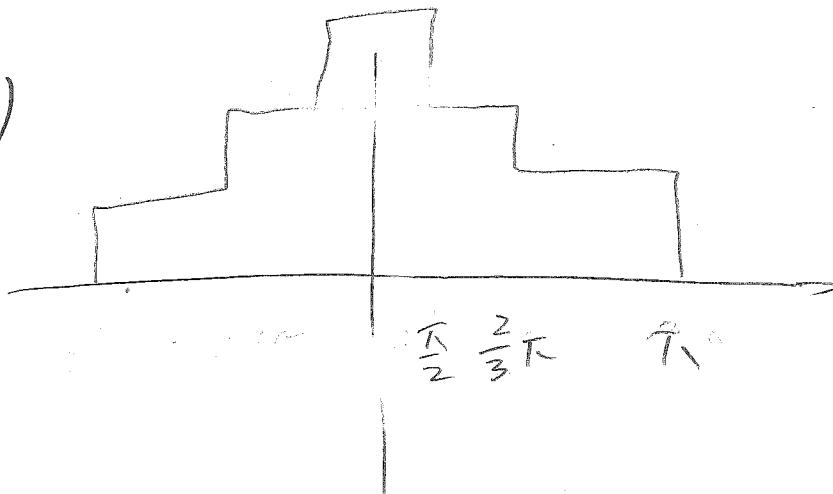
$$H(e^{j\omega})$$



$$y(\omega) = (2)3 + (2)(3)(e^{j\frac{\pi}{3}} + e^{-j\frac{\pi}{3}}) + e^{j\frac{\pi}{2}} + e^{-j\frac{\pi}{2}}$$

(#4) $\omega_M = 30$, Nyquist rate $\omega_N = 2\omega_M = 60$

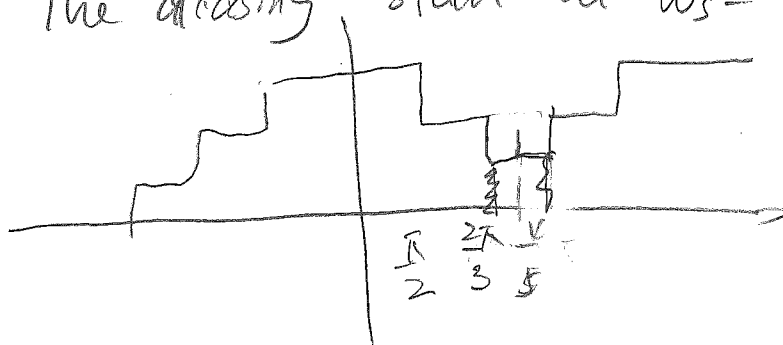
(a) $X(e^{j\omega})$



(b)

$\omega_s = 30 < 60 \Rightarrow$ Aliasing

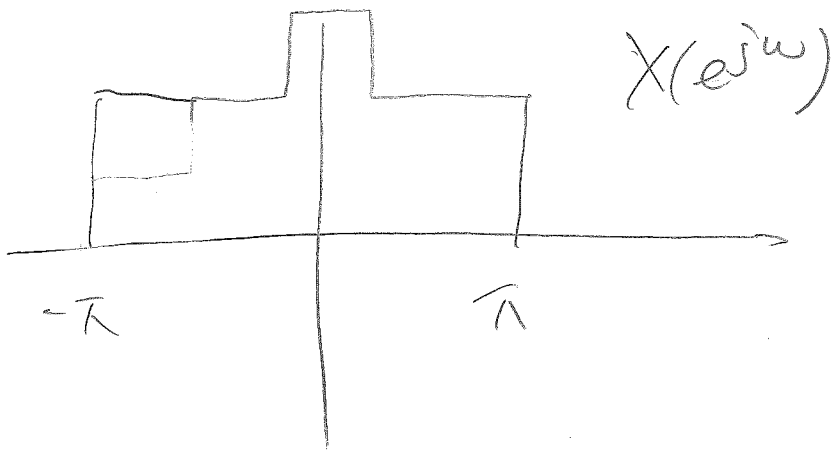
The aliasing starts at $\omega_s - \omega_M = 30 - 30 = 20$



$$\frac{20}{50} \cdot 2\pi = \frac{4\pi}{5}$$

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(b)

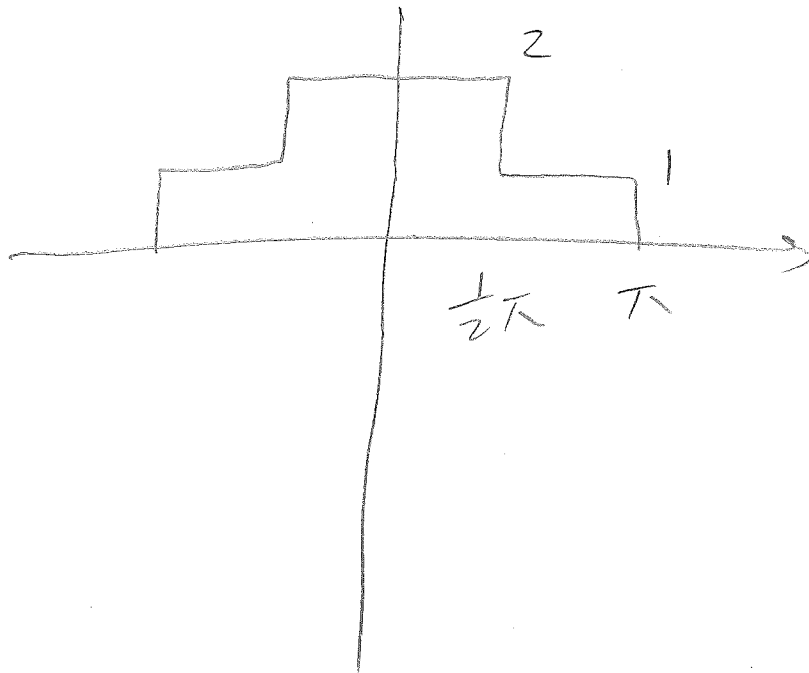


(15)

$$X[n] = \frac{\sin(n\pi)}{\pi n} + \frac{\sin(\frac{1}{2}n\pi)}{\pi n}$$

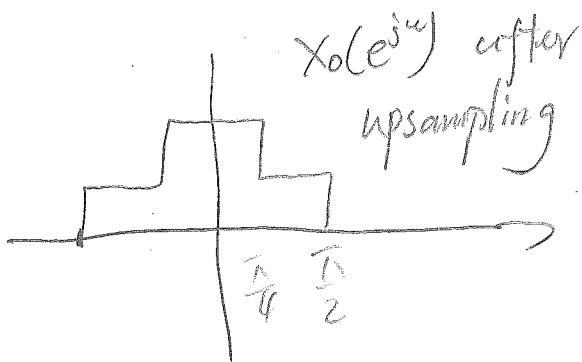
(a)

$X(e^{j\omega})$



(b)

upsampling



Pass through $H(e^{j\omega})$

