**6.2-8** Suppose that $X(\Omega)$ is a spectrum bandlimited to $\pi/2$ rad/sample. Find the spectrum of the signal defined by

$$y[n] = \begin{cases} x[n] & n \text{ even} \\ 0 & n \text{ odd} \end{cases} .$$

Using some hypothetical (bandlimited) spectrum $X(\Omega)$, sketch the spectrum $Y(\Omega)$.

$$Y[n] = x[n] \cdot h[n]$$

where $h[n] = \frac{1}{2}\left(e^{j\pi n} + 1\right)$

using Transform pair:

$$e^{j\Omega_0 n} \iff 2\pi \sum_{k=-\infty}^{\infty} \delta(\Omega - \Omega_0 - 2\pi k)$$

$$H(\Omega) = \pi\left(\ldots + \delta(\Omega - \pi - \rho) + \delta(\Omega) + \delta(\Omega - \pi + 2\pi) + \ldots\right)$$



$$x[n] \cdot h[n] \iff \frac{1}{2\pi} X(\Omega) * H(\Omega)$$

Convoluting with delta leads to replication

So, $Y(\Omega)$ will be periodic replications

of $X(\Omega)$ centered every $\pi k$ for $k = -\infty : \infty$

and scaled by $\frac{1}{2\pi}$. The maximum

bandwidth $X(\Omega)$ can be is $\frac{\pi}{2}$