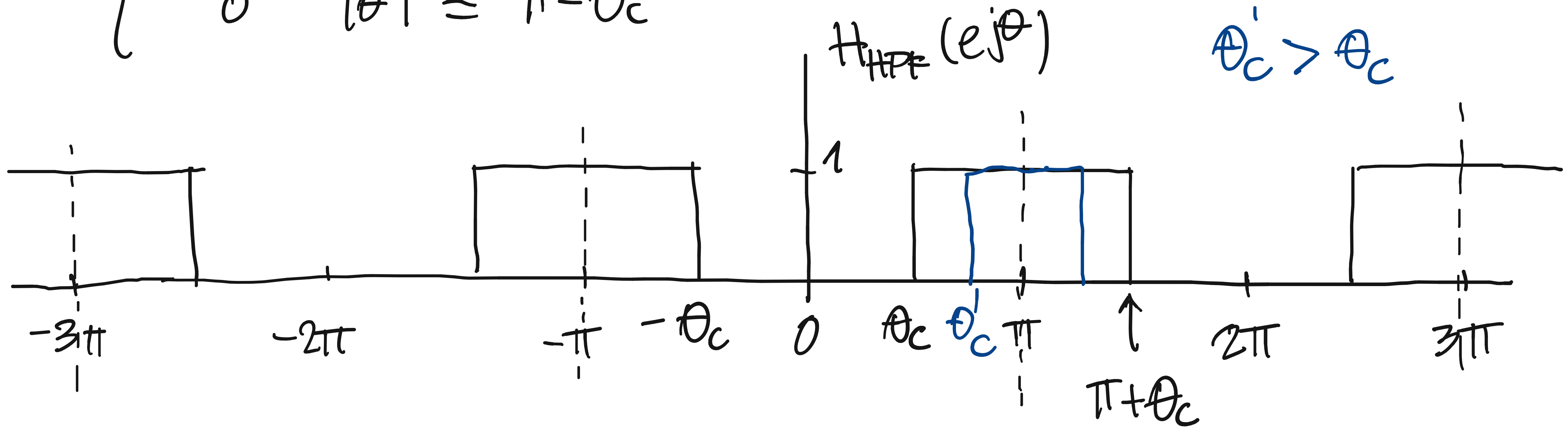
PRÁCTICO 6, EJERCICIO 5

$$H_{HPF}(e^{j\theta}) = \begin{cases} 1 & \pi-\theta_c \leq |\theta| \leq \pi \\ 0 & |\theta| \leq \pi-\theta_c \end{cases}$$

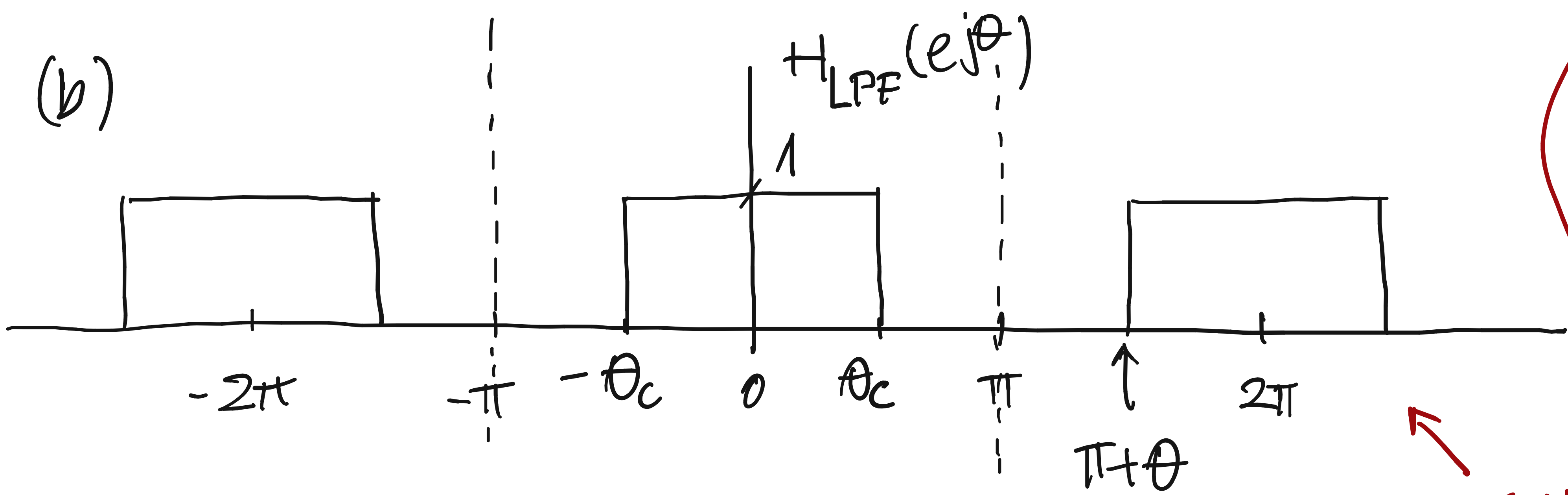
FILTRO PASAALTOS IDEA

(a)



2π PERIÓDICA $(-\pi, \pi)$

(b)



2π PERIÓDICA $(-\pi, \pi)$

$$H_{LPF}(e^{j\theta}) = \Pi\left(\frac{\theta}{2\theta_c}\right)$$

TABLA

$$h_{LPF}[n] = \frac{\theta_c}{\pi}\,\text{sinc}\left(\frac{\theta_c n}{\pi}\right) = \frac{\sin \theta_c n}{\pi n}$$

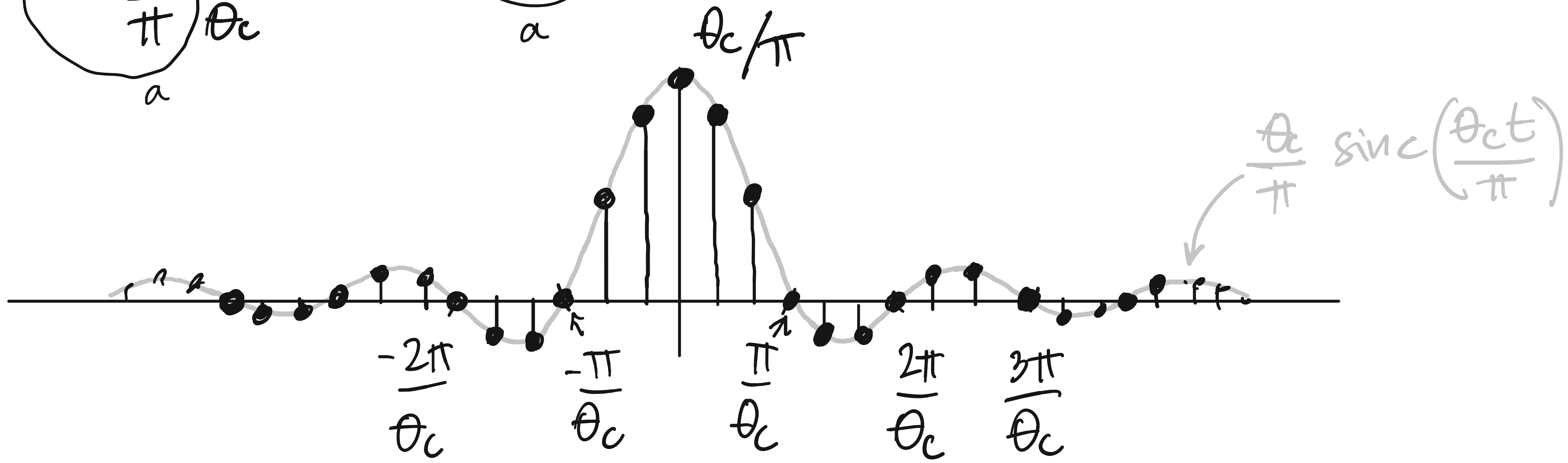
SON EL MISMO ESPECTRO DESPLAZADO π.

$$H_{HPF}(e^{j\theta}) = H_{LPF}(e^{j(\theta-\pi)})$$

$$h_{LPF}[n] = \frac{1}{2\pi}\int_{-\pi}^{\pi} H_{LPF}(e^{j\theta})\, e^{jn\theta}\, d\theta = \frac{1}{2\pi}\int_{-\theta_c}^{\theta_c} e^{jn\theta}\, d\theta = \frac{1}{2\pi}\frac{1}{jn}\left(e^{j\theta_c n} - e^{-j\theta_c n}\right)$$

$$= \frac{\sin \theta_c n}{\pi n} = \frac{1}{\underbrace{\pi n \frac{\theta_c}{\pi}}_{a}\frac{\pi}{\theta_c}} \sin\Big(\underbrace{\frac{\theta_c n}{\pi}}_{a}\pi\Big) = \frac{\theta_c}{\pi}\,\mathrm{sinc}\left(\frac{\theta_c n}{\pi}\right)$$

$$\mathrm{sinc}\, a = \frac{\sin \pi a}{\pi a}$$



(c) $h_{HPF}[n] = \frac{\sin(\theta_c n)}{\pi n}\, g[n]$ Notar que $H_{HPF}(e^{j\theta}) = H_{LPF}(e^{j(\theta-\pi)})$

Sabemos que (Tabla): $x[n]\, e^{j\theta_0 n} \overset{\mathcal{F}}{\longleftrightarrow} X(e^{j(\theta-\theta_0)})$

$$h_{HPF}[n] = h_{LPF}[n]\, e^{j\pi n} = h_{LPF}[n](-1)^n = \frac{\sin(\theta_0 n)}{\pi n}\, g[n] \quad \Rightarrow \quad g[n] = (-1)^n$$

(d) Si $\theta_c \uparrow$ el ancho de banda del HPF disminuye, se concentra menos alrededor del origen.