IEE 2103 Señales y Sistemas

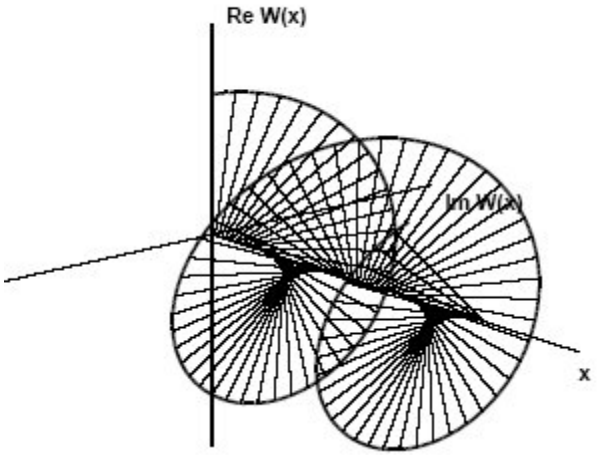
Clase 3B: Bases de Fourier y ejemplos

3.2 Bases de Fourier

El conjunto $\{W_u(x),\ \forall u\}$ define una base ortonormal

$$W_u(x) = e^{-i2\pi ux}$$

$$u = -2$$

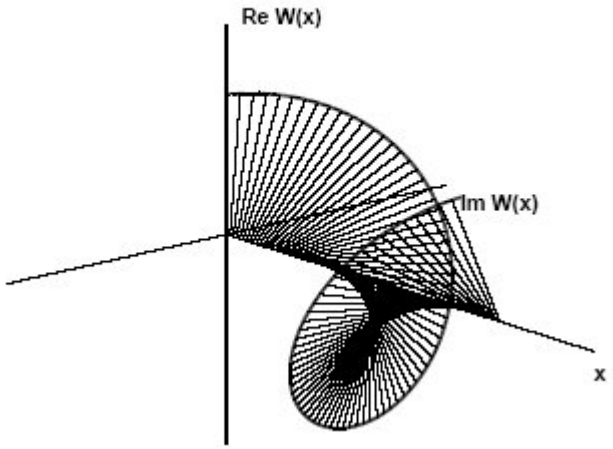


3.2 Bases de Fourier

El conjunto $\{W_u(x),\ \forall u\}$ define una base ortonormal

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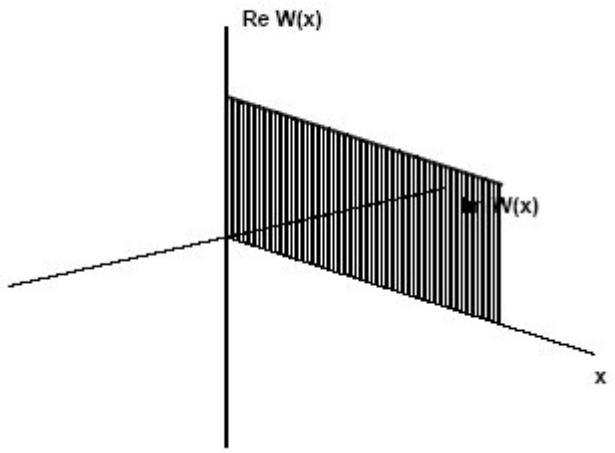


3.2 Bases de Fourier

El conjunto $\{W_u(x),\ \forall u\}$ define una base ortonormal

$$W_u(x) = e^{-i2\pi ux}$$

$u = 0$

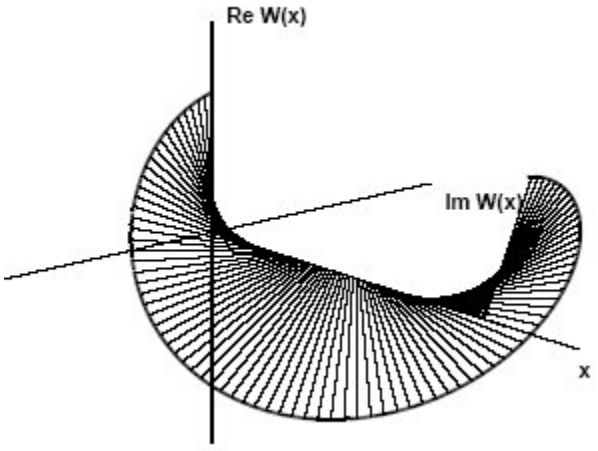


3.2 Bases de Fourier

El conjunto $\{W_u(x),\ \forall u\}$ define una base ortonormal

$$W_u(x) = e^{-i2\pi ux}$$

$$u = 1$$

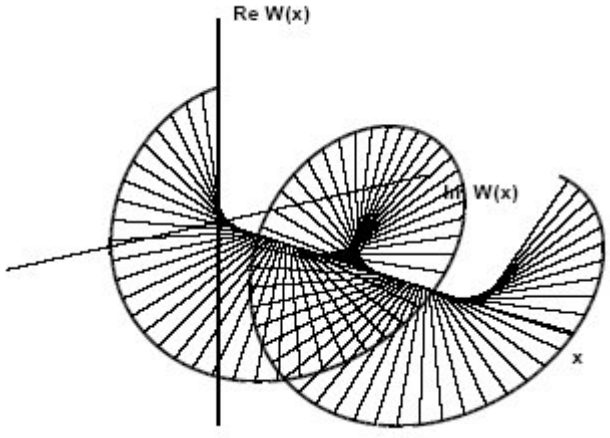


3.2 Bases de Fourier

El conjunto $\{W_u(x),\ \forall u\}$ define una base ortonormal

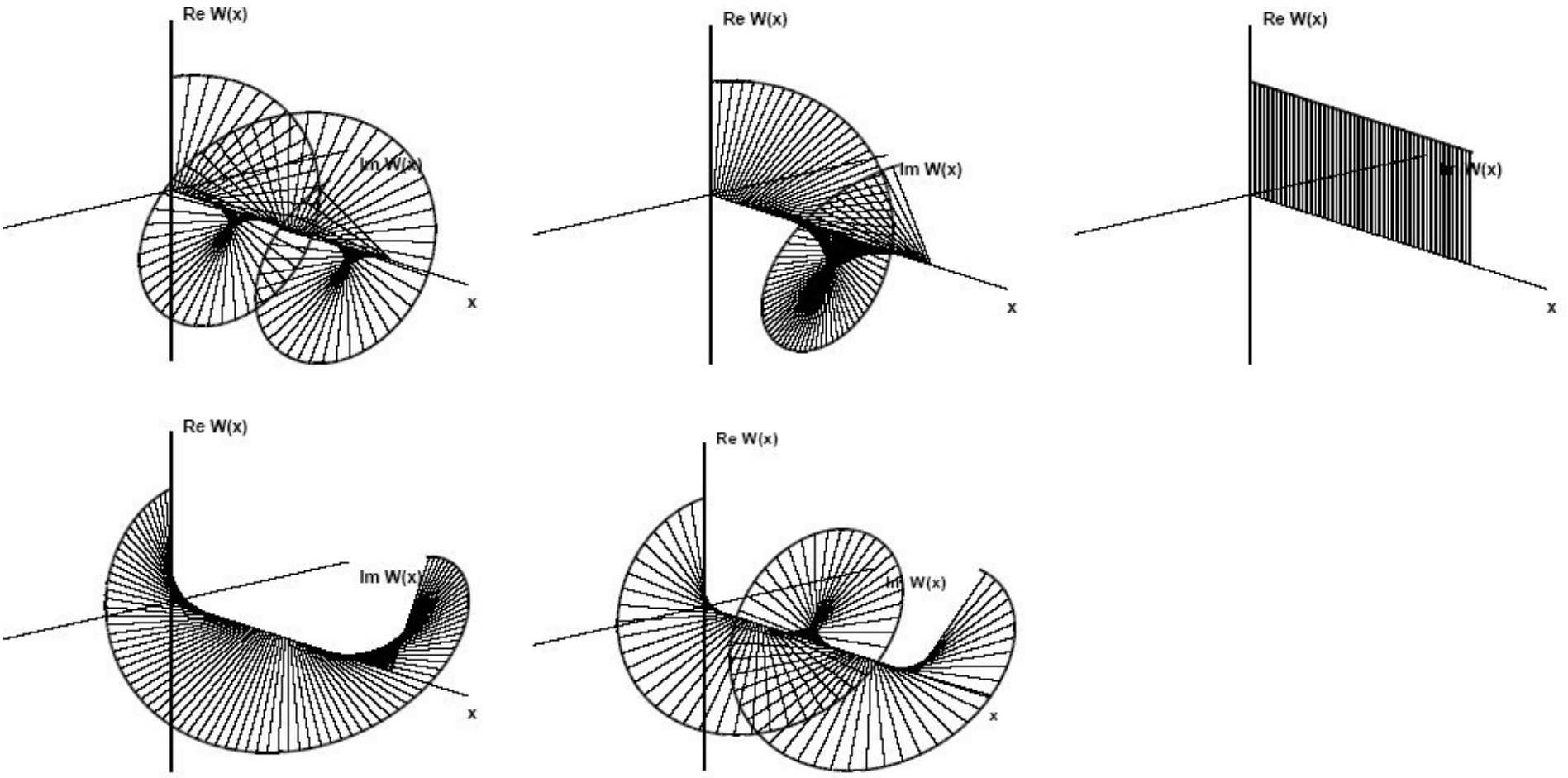
$$W_u(x) = e^{-i2\pi ux}$$

$$u = 2$$



3.2 Bases de Fourier

$$W_u(x) = e^{-i2\pi ux}$$



3.2 Bases de Fourier

Un poco de notación

$$F(u) = \mathcal{F}\{f(x)\} = \int_{-\infty}^{\infty} f(x) e^{-i2\pi ux}\, dx$$

$$f(x) = \mathcal{F}^{-1}\{F(u)\} = \int_{-\infty}^{\infty} F(u) e^{i2\pi ux}\, du$$

$$f(x) \xrightarrow{\mathcal{F}} F(u)$$

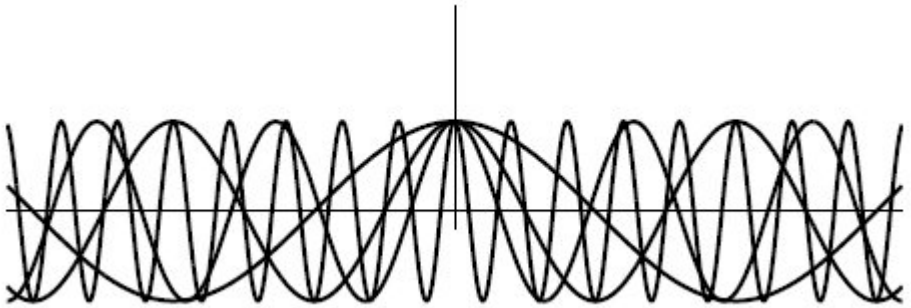
$$f(x) \longrightarrow F(u)$$

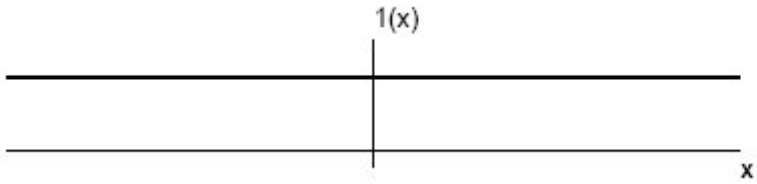
3.3 Ejemplos de pares de Fourier

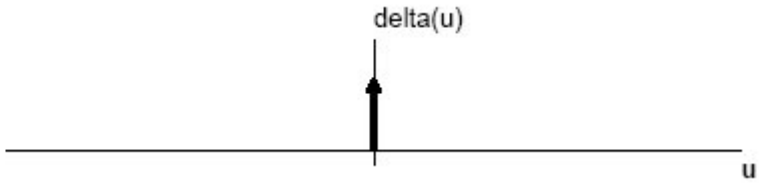
Impulso y uno

$$\delta(x) \longrightarrow 1(u)$$

$$1(x) \longrightarrow \delta(u)$$





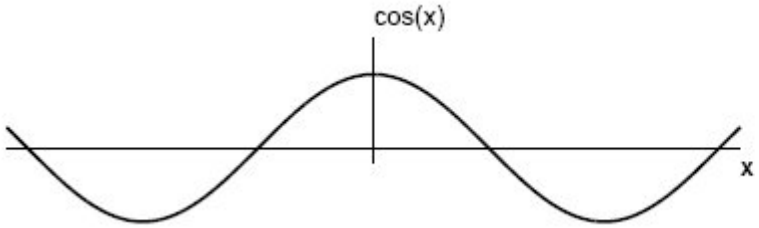


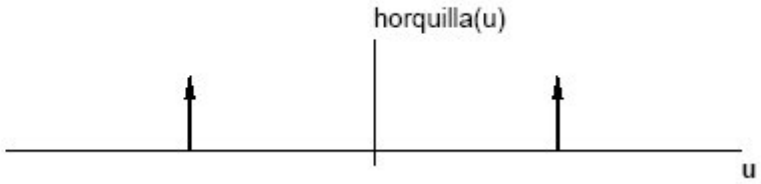
3.3 Ejemplos de pares de Fourier

Coseno y horquilla

$$\cos \pi x \longrightarrow \uparrow\uparrow (u)$$

$$\uparrow\uparrow (x) \longrightarrow \cos \pi u$$

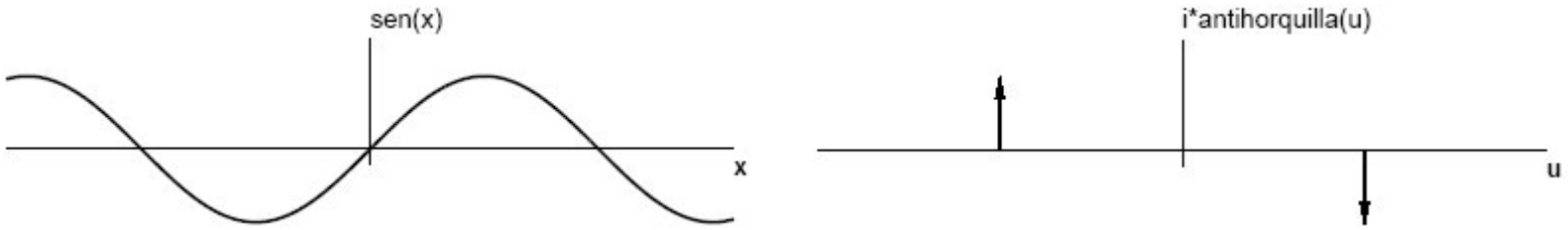




3.3 Ejemplos de pares de Fourier

Seno y antihorquilla

$$\text{sen}\,\pi x \longrightarrow i \uparrow\downarrow (u)$$

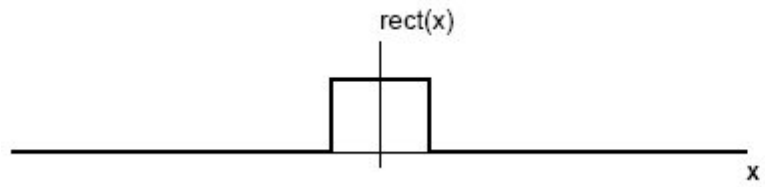


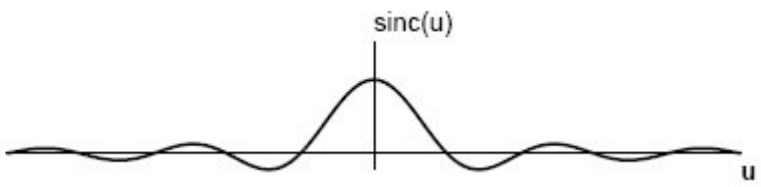
3.3 Ejemplos de pares de Fourier

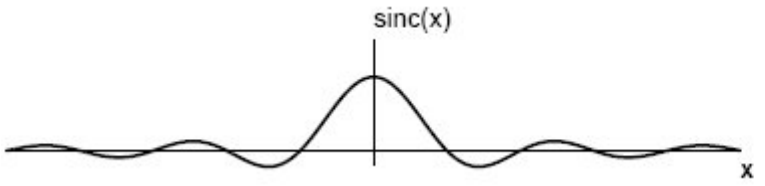
Rect y sinc

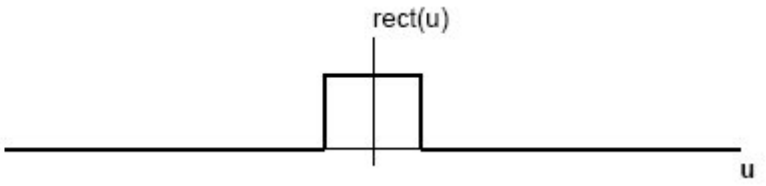
$$\sqcap(x) \longrightarrow \operatorname{sinc} u = \frac{\operatorname{sen} \pi u}{\pi u}$$

$$\operatorname{sinc} x \longrightarrow \sqcap(u)$$







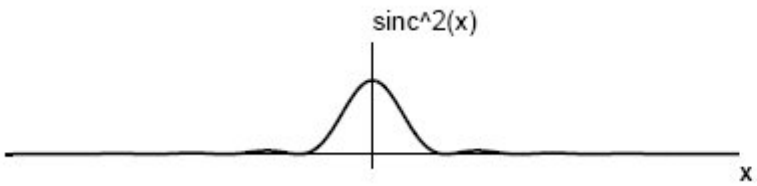


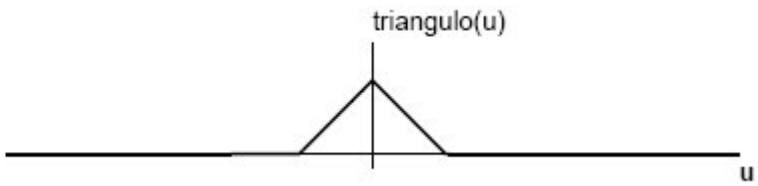
3.3 Ejemplos de pares de Fourier

Triángulo y sinc cuadrado

$$\wedge(x) \longrightarrow \text{sinc}^2 u$$

$$\text{sinc}^2 x \longrightarrow \wedge(u)$$



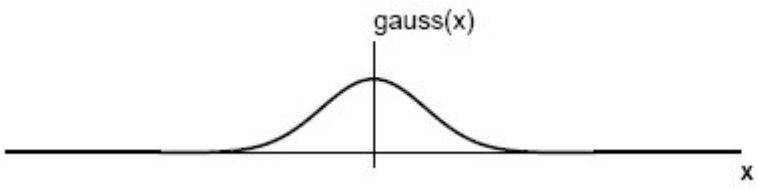


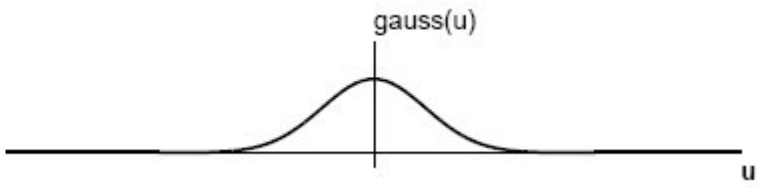
3.3 Ejemplos de pares de Fourier

Gauss

$$\text{Gauss} \longrightarrow \text{Gauss}$$

$$e^{-\pi x^2} \longrightarrow e^{-\pi u^2}$$

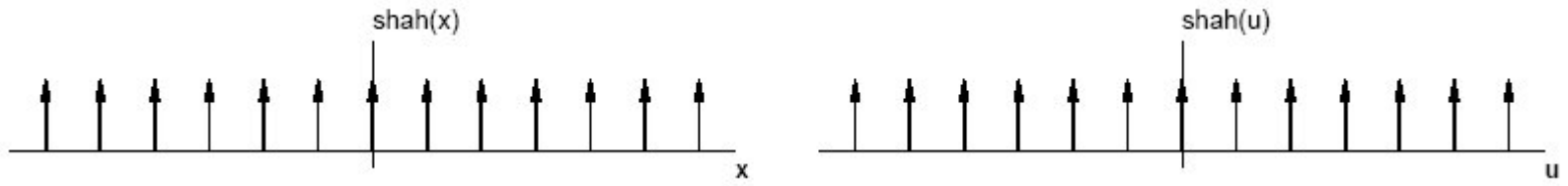




3.3 Ejemplos de pares de Fourier

Shah

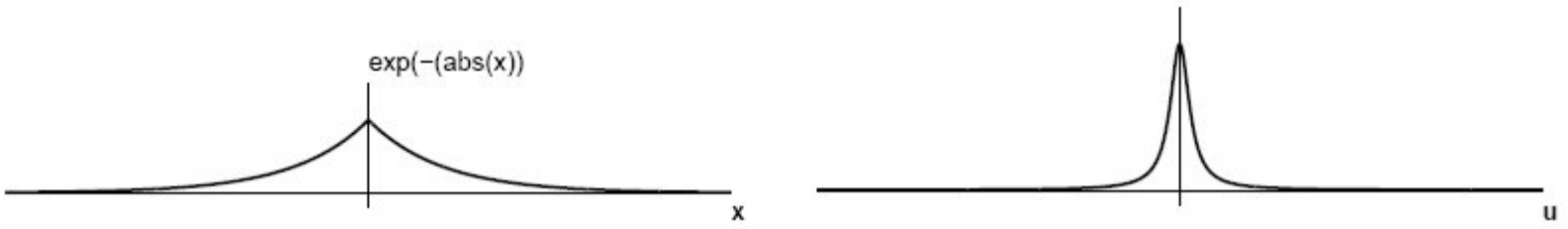
$$\text{Ш}(x) \longrightarrow \text{Ш}(u)$$



3.3 Ejemplos de pares de Fourier

Exponencial

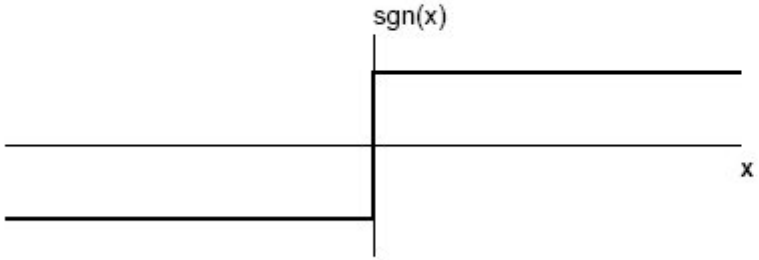
$$e^{-|x|} \longrightarrow \frac{2}{1+(2\pi u)^2}$$

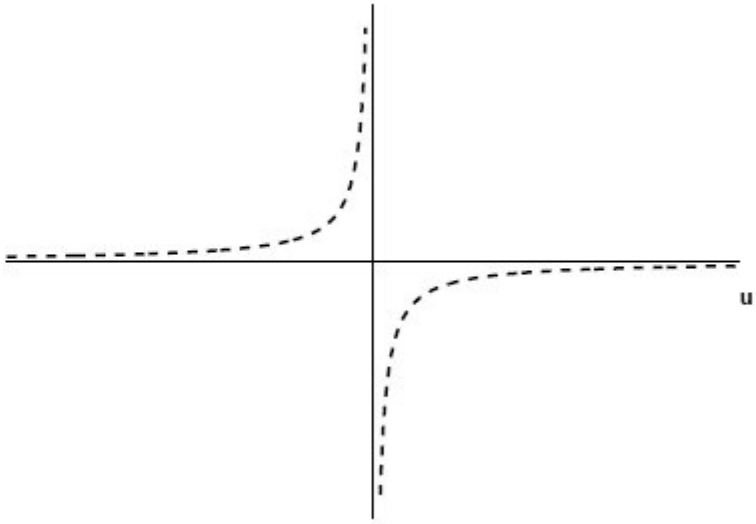


3.3 Ejemplos de pares de Fourier

Signo

$$\operatorname{sgn} x \longrightarrow -\frac{i}{\pi u}$$





3.3 Ejemplos de pares de Fourier

Escalón

$$\sqcap(x) \longrightarrow \frac{1}{2}\delta(u) - \frac{i}{2\pi u}$$

