

FOURIER TRANSFORMS

$f(x)$ is defined for $x \in (-\infty, \infty)$

$$\mathcal{F}\{f(x)\} = F(\xi) = \int_{-\infty}^{\infty} e^{-i\xi x} f(x) dx$$

$$\mathcal{F}^{-1}\{F(\xi)\} = f(x) = \frac{1}{2\pi} \int_{-\infty}^{\infty} e^{ix\xi} F(\xi) d\xi$$

$$\mathcal{F}_c\{f'(x)\} = \int_0^{\infty} f'(x) \cos \xi x dx = \xi \mathcal{F}_s\{f(x)\} - f(0^+)$$

$$\mathcal{F}_c\{f''(x)\} = \int_0^{\infty} f''(x) \cos \xi x dx = -\xi^2 \mathcal{F}_c\{f(x)\} - f'(0^+)$$

$$\mathcal{F}_s\{f'(x)\} = \int_0^{\infty} f'(x) \sin \xi x dx = -\xi \mathcal{F}_c\{f(x)\}$$

$$\mathcal{F}_s\{f''(x)\} = \int_0^{\infty} f''(x) \sin \xi x dx = -\xi^2 \mathcal{F}_s\{f(x)\} + \xi f(0^+)$$

$$\mathcal{F}\{f'(x)\} = \int_{-\infty}^{\infty} e^{-i\xi x} f'(x) dx = i\xi \mathcal{F}\{f(x)\}$$

$$\mathcal{F}\{f''(x)\} = \int_{-\infty}^{\infty} e^{-i\xi x} f''(x) dx = -\xi^2 \mathcal{F}\{f(x)\}$$

$F(\xi) G(\xi)$

$$F(\xi) = \int_0^{\infty} f(x) \cos \xi x dx$$

$$G(\xi) = \int_0^{\infty} g(x) \cos \xi x dx$$

$$\mathcal{F}_c^{-1}\{F \cdot G\} = \frac{1}{2} \int_0^{\infty} f(u) [g(x-u) + g(x+u)] du$$

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$$\mathcal{F}_c\{F \cdot G\} = \frac{1}{2} \int_0^{\infty} f(u) [g(x-u) + g(x+u)] du$$

$$F(\xi) = \int_0^{\infty} f(x) \sin \xi x dx$$

$$G(\xi) = \int_0^{\infty} g(x) \sin \xi x dx$$

$$\mathcal{F}_s^{-1}\{F \cdot G\} = \frac{1}{2} \int_0^{\infty} f(u) [g(x-u) - g(x+u)] du$$

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$$F(\xi) = \int_{-\infty}^{\infty} e^{-i\xi x} f(x) dx$$

$$G(\xi) = \int_{-\infty}^{\infty} e^{-i\xi x} g(x) dx$$

$$\mathcal{F}^{-1}\{F \cdot G\} = \int_{-\infty}^{\infty} f(u) g(x-u) du$$

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