Fórmulas primer parcial, Mate V

(Ariel Nowik: anowik@itba.edu.ar - Consultas - correcciones - sugerencias)

Famosos transformada de fourier continua

$x(t)$	$X(f)$
$X(t)$	$x(-f)$
$x(t-t_0)$	$e^{-j2\pi ft_0}X(f)$
$e^{j2\pi f_0 t}x(t)$	$X(f-f_0)$
$x(at)$	$\frac{1}{\lVert a \rVert}X(f/a)$
$(x*y)(t)$	$XY(f)$
$xy(t)$	$(X*Y)(-f)$
$x^{(n)}(t)$	$(j2\pi f)^{(n)}X(f)$
$t^n x(t)$	$\frac{1}{(-j2\pi)^{(n)}}\frac{d^n}{df^n}X(f)$
$\delta(t-t_0)$	$e^{-j2\pi ft_0}$
$e^{j2\pi f_0 t}$	$\delta(f-f_0)$
$\Lambda(\frac{t}{\tau})$	$\tau sinc^2(\tau f)$
$\Pi(\frac{t}{\tau})$	$\tau sinc(\tau f)$
$u(t)$	$\frac{\delta(f)}{2}+\frac{1}{j2\pi f}$
$signo(t)$	$\frac{1}{j\pi f}$
$cos(2\pi f_0 t)$	$\frac{1}{2}\delta(f-f_0)+\frac{1}{2}\delta(f+f_0)$
$sin(2\pi f_0 t)$	$\frac{1}{2j}\delta(f-f_0)-\frac{1}{2j}\delta(f+f_0)$
$e^{-\alpha t}u(t)$	$\frac{1}{\alpha+j2\pi f}, \alpha>0$
$e^{-\alpha\lVert t\rVert}$	$\frac{2\alpha}{\alpha^2+(2\pi f)^2}$
$x(t)$ periodica	$\sum_{n=-\infty}^{\infty} X_n\delta(f-n/T)$
$\sum_{n=-\infty}^{\infty}\delta(t-nT)$	$\sum_{n=-\infty}^{\infty}\frac{1}{T}\delta(f-\frac{n}{T})$
$\int_{-\infty}^{t}x(\tau)d\tau$	$\frac{X(0)}{2}\delta(f)+\frac{X(f)}{i2\pi f}=X(f)*F(u(t))$

Famosos transformada discreta de fourier

$x(n)$	$X(f)$
$x(n-n_0)$	$X(f)e^{-i2\pi f n_0} = X(f)s^{n_0}$
$x(n)e^{i2\pi f_0 n}$	$X(f-f_0)$
$e^{i2\pi f_0 n}$	$\delta(f-f_0)$
$x(n)$ periodica	$\sum_{k=0}^{N-1} a_k \delta(f-\frac{k}{N})$
$x*y(n)$	$X(f)Y(f)$
$x(n)y(n)$	$\int_0^1 X(s)Y(f-s)ds$
$n^k x(n)$	$(\frac{-1}{i2\pi})^k \frac{d^k}{df^k} X(f)$
$u(n)$	$\frac{\delta(f)}{2} + \frac{1}{1-e^{-i2\pi f}} = \frac{\delta(f)}{2} + \frac{1}{1-s}$
$\alpha^n u(n)$	$\frac{1}{1-\alpha e^{-i2\pi f}} = \frac{1}{1-\alpha s}, \lVert\alpha\rVert < 1$
$n\alpha^{(n)} u(n)$	$\frac{\alpha e^{-i2\pi f}}{(1-\alpha e^{-i2\pi f})^2} = \frac{\alpha s}{(1-\alpha s)^2}, \lVert\alpha\rVert < 1$

Integrales utiles

$x(t)$	$\int x(t)dt$
te^{at}	$\frac{e^{at}}{a}(t-\frac{1}{a})$
$tcos(at)$	$\frac{cos(at)}{a^2} + \frac{tsin(at)}{a}$
$tsin(at)$	$\frac{sin(at)}{a^2} - \frac{tcos(at)}{a}$

Definiciones

Serie de fourier trigonometrica continua

$$x(t) \sim a_0 + \sum_{k\geq 1} a_k cos(2\pi kt/T) + b_k sin(2\pi kt/T)$$

Coeficientes serie de fourier trigonometrica continua

$$a_0 = 1/T \int_{t_0}^{t_0+T} x(t)dt \qquad a_k = 2/T \int_{t_0}^{t_0+T} x(t)cos(2\pi kt)dt \qquad b_k = 2/T \int_{t_0}^{t_0+T} x(t)sin(2\pi kt)dt$$

Parseval serie de fourier trigonometrica continua

$$\frac{2}{T}\int_{t_0}^{t_0+T} |x(t)|^2 dt = 2|a_0|^2 + \sum_{k\geq 1} |a_k|^2 + |b_k|^2$$

Serie de fourier exponencial continua

$$x(t) \sim \sum_{k \epsilon Z} X_k e^{i2\pi kt/T}$$

Coeficientes de fourier exponencial continua

$$X_k = 1/T \int_{t_0}^{t_0+T} x(t) e^{-i2\pi kt/T} dt$$

Parseval serie de fourier exponencial continua

$$\frac{1}{T} \int_{t_0}^{t_0+T} |x(t)|^2 dt = \sum_{k \epsilon Z} |X_k|^2$$

Serie de fourier discreta

$$x(n) = \sum_{k=k_0}^{k_0+N-1} c_k e^{i2\pi kn/N}$$

Coeficientes de fourier discreta

$$c_k = 1/N \sum_{n=n_0}^{n_0+N-1} x(n) e^{-i2\pi nk/N}$$

Transformada de fourier continua

$$X(f) = \int_{-\infty}^{\infty} x(t) e^{-i2\pi ft} dt \qquad x(t) = \int_{-\infty}^{\infty} X(f) e^{i2\pi ft} df$$

Transformada de fourier discreta

$$X(f) = \sum_{n=-\infty}^{\infty} x(n) e^{-i2\pi fn} \qquad x(n) = \int_{t_0}^{t_0+1} X(f) e^{i2\pi fn} df$$