TABLA DE INTEGRALES DEFINIDAS

1	$\int_0^\infty x^{n-1}e^{-x}dx=\Gamma(n)$	**9**	$\int_0^\infty x^{m-1}(1-x)^{n-1}dx=\frac{\Gamma(n)\Gamma(m)}{\Gamma(m+n)}$
2	$\int_0^\infty sen\left(x^2\right)dx=\int_0^\infty \cos\left(x^2\right)dx=\frac{1}{2}\sqrt{\frac{®}{2}}$	**10**	$\int_0^\infty \frac{x^{m-1}}{1+x^n}dx=\frac{®/n}{sen\left(m®/n\right)}\quad n>m>0$
3	$\int_0^\infty \frac{sen(x)\cos(nx)}{x}dx=\begin{cases} ®/2 & n^2<1 \\ ®/4 & n^2=1 \\ 0 & n^2>1\end{cases}$	**11**	$\int_0^\infty x^n e^{-ax}dx=\frac{n!}{a^{n+1}}\quad n\geq 1,\ a>0$
4	$\int_0^\infty \frac{sen^2(x)}{x^2}dx=\frac{®}{2}$	**12**	$\int_0^\infty e^{-a^2x^2}dx=\frac{1}{2a}\sqrt{®}\quad a>0$
5	$\int_0^\infty \frac{\cos(nx)}{1+x^2}dx=\frac{®}{2}e^{-\lvert n\rvert}$	**13**	$\int_0^\infty x^2e^{-x^2}dx=\frac{1}{4}\sqrt{®}$
6	$\int_0^\infty \sin c(x)dx=\int_0^\infty \sin c^2(x)dx=\frac{1}{2}$	**14**	$\int_0^\infty e^{-ax}\cos(x)dx=\frac{a}{1+a}\quad a>0$
7	$\int_0^\infty \frac{sen(x)}{x}dx=\int_0^\infty \frac{tg(x)}{x}dx=\frac{®}{2}$	**15**	$\int_0^\infty e^{-ax}sen(x)dx=\frac{1}{1+a^2}\quad a>0$
8	$\int_0^\infty \sqrt{x}e^{-ax}dx=\frac{1}{2a}\sqrt{\frac{®}{a}}$	**16**	$\int_0^\infty e^{-a^2x^2}\cos(bx)dx=\frac{1}{2a}e^{-\left(b/2a\right)^2}$

TABLA DE INTEGRALES INDEFINIDAS IMPORTANTES

1	$\int xe^{ax}dx=\frac{1}{a^2}e^{ax}(ax-1)+c$
2	$\int x^2e^{ax}dx=\frac{1}{a^3}e^{ax}\left[Arcsen(ax)-2ax+2\right]+c$
3	$\int e^{ax}sen(bx)dx=\frac{1}{a^2+b^2}e^{ax}\left[a\ sen(bx)-b\cos(bx)\right]+c$
4	$\int e^{ax}\cos(bx)dx=\frac{1}{a^2+b^2}e^{ax}\left[a\cos(bx)+b\ sen(bx)\right]+c$
5	$\int xsen(ax)dx=\frac{1}{a^2}\left[sen(ax)-ax\cos(ax)\right]+c$
6	$\int x\cos(ax)dx=\frac{1}{a^2}\left[\cos(ax)+axsen(ax)\right]+c$
7	$\int x^2sen(ax)dx=\frac{2x}{a^3}sen(ax)+\frac{2}{a^3}\cos(ax)-\frac{x^2}{a}\cos(ax)+c$
8	$\int x^2\cos(ax)dx=\frac{2x}{a^2}\cos(ax)-\frac{2}{a^3}sen(ax)\frac{x^2}{a}sen(ax)+c$
9	$\int \cos(ax)\cos(bx)dx=\frac{1}{2}\left[\frac{sen\left[(a-b)x\right]}{a-b}+\frac{sen\left[(a+b)x\right]}{a+b}\right]+c\quad a^2\neq b^2$

10	$\int sen(ax)\cos(bx)\,dx = -\frac{1}{2}\left[\frac{\cos\left[(a-b)x\right]}{a-b}+\frac{\cos\left[(a+b)x\right]}{a+b}\right]+c \quad a^2 \neq b^2$
11	$\int sen(ax)sen(bx)\,dx = -\frac{1}{2}\left[\frac{sen\left[(a-b)x\right]}{a-b}-\frac{sen\left[(a+b)x\right]}{a+b}\right]+c \quad a^2 \neq b^2$
12	$\int x\, sen^2(ax)\,dx = \frac{x^2}{4}-\frac{x\, sen(2ax)}{4a}-\frac{\cos(2ax)}{8a^2}+c$
13	$\int x\, \cos^2(ax)\,dx = \frac{x^2}{4}+\frac{sen(2ax)}{4a}-\frac{\cos(2ax)}{8a^2}+c$
14	$\int sen^n(ax)\cos(ax)\,dx = -\frac{1}{a(n+1)}sen^{n+1}(ax)+c \quad n \neq -1$
15	$\int \cos^n(ax)sen(ax)\,dx = \frac{1}{a(n+1)}\cos^{n+1}(ax)+c \quad n \neq -1$

TABLA DE IDENTIDADES TRIGONOMÉTRICAS

1	$sen(w_1t \pm w_2t) = sen(w_1t)\cos(w_2t) \pm \cos(w_1t)sen(w_2t)$	**15**	$sen^2(wt)+\cos^2(wt)=1$
2	$\cos(w_1t \pm w_2t) = \cos(w_1t)\cos(w_2t) \mp sen(w_1t)sen(w_2t)$	**16**	$sen^2(wt)=\frac{1-\cos(2wt)}{2}$
3	$sen(w_1t)+sen(w_2t)=2sen\left(\frac{w_1t+w_2t}{2}\right)\cos\left(\frac{w_1t-w_2t}{2}\right)$	**17**	$\cos^2(wt)=\frac{1+\cos(2wt)}{2}$
4	$sen(w_1t)-sen(w_2t)=2sen\left(\frac{w_1t-w_2t}{2}\right)\cos\left(\frac{w_1t+w_2t}{2}\right)$	**18**	$1+ctg^2(wt)=\csc^2(x)wt$
5	$\cos(w_1t)+\cos(w_2t)=2\cos\left(\frac{w_1t+w_2t}{2}\right)\cos\left(\frac{w_1t-w_2t}{2}\right)$	**19**	$1+tg^2(wt)=\sec^2(wt)$
6	$\cos(w_1t)-\cos(w_2t)=-2sen\left(\frac{w_1t+w_2t}{2}\right)sen\left(\frac{w_1t-w_2t}{2}\right)$	**20**	$sen(2wt)=2\,sen(wt)\cos(wt)$
7	$tg(w_1t) \pm tg(w_2t)=\frac{sen(w_1t \pm w_2t)}{\cos(w_1t)\,\cos(w_2t)}$	**21**	$\cos(2wt)=\cos^2(wt)\text{-}sen^2(wt)$
8	$\cos(w_1t)\cos(w_2t)=\frac{1}{2}\left[\cos(w_1t+w_2t)+\cos(w_1t-w_2t)\right]$	**22**	$sen(3wt)=3\,sen(wt)-4sen^3(wt)$
9	$sen(w_1t)\cos(w_2t)=\frac{1}{2}\left[sen(w_1t+w_2t)+sen(w_1t-w_2t)\right]$	**23**	$\cos(3wt)=4\cos^3(wt)-3\cos(wt)$
10	$sen(w_1t)sen(w_2t)=\frac{1}{2}\left[\cos(w_1t-w_2t)-\cos(w_1t+w_2t)\right]$	**24**	$sen\left(\frac{wt}{2}\right)=\pm\sqrt{\frac{1-\cos(wt)}{2}}$
11	$sen(4wt)=8\cos^3(wt)senx-4\cos(wt)sen(wt)$	**25**	$\cos\left(\frac{wt}{2}\right)=\pm\sqrt{\frac{1+\cos(wt)}{2}}$
12	$\cos(4wt)=8\cos^4(wt)\text{-}8\cos^2(wt)+1$	**26**	$tg\left(\frac{wt}{2}\right)=\frac{sen(wt)}{1+\cos(wt)}$
13	$\cos(wt)=\cos\left(\frac{®}{2}-wt\right)=-\cos(®-wt)$		
14	$sen(wt)=\cos\left(\frac{®}{2}-wt\right)=sen(®-wt)$		

TABLA DE IDENTIDADES COMPLEJAS

$z = x + jy$	$z = \lvert z \rvert e^{j\theta} \quad \theta = \arg(z)$
$\lvert z \rvert = \sqrt{x^2 + y^2} \quad \wedge \quad \theta = \arg(z) = arctg\left(\frac{y}{x}\right)$	$\lvert e^{j\theta} \rvert = 1$
$\arg(z_1 \cdot z_2) = \arg(z_1) + \arg(z_2)$	$e^{j\theta_1} e^{j\theta_2} = e^{j(\theta_1 + \theta_2)}$
$\arg\left(\frac{z_1}{z_2}\right) = \arg(z_1) - \arg(z_2)$	$e^{-j\theta} = \frac{1}{e^{j\theta}}$
$e^z = e^{x + jy}$	$\frac{e^{j\theta_1}}{e^{j\theta_2}} = e^{j(\theta_1 - \theta_2)}$
$e^z \neq 0 \quad \forall\, z \in \mathrm{C}$	$\left(e^{j\theta}\right)^k = e^{jk\theta}$
$\lvert e^z \rvert = \lvert e^{x+jy} \rvert = \lvert e^x \rvert \underbrace{\lvert e^{jy} \rvert}_{1} = e^x \quad y = \arg\left(e^z\right)$	$e^{\pm jwt} = \cos(wt) \pm j\, sen(wt)$
$z_1 \cdot z_2 = \lvert z_1 \rvert \cdot \lvert z_2 \rvert e^{j\left[\arg(z_1) + \arg(z_2)\right]}$	$\cos(wt) = sen\left(wt + \frac{\pi}{2}\right) = \frac{e^{jwt} + e^{-jwt}}{2}$
$\frac{z_1}{z_2} = \frac{\lvert z_1 \rvert}{\lvert z_2 \rvert} e^{j\left[\arg(z_1) - \arg(z_2)\right]}$	$sen(wt) = \cos\left(wt - \frac{\pi}{2}\right) = \frac{e^{jwt} - e^{-jwt}}{2j}$

TABLA DE RESULTADOS GENERALES

FUNCIÓN	n	n **PAR**	n **IMPAR**	$\frac{n}{2}$ **PAR**	$\frac{n}{2}$ **IMPAR**
$sen(n\pi)$	0	0	0	0	0
$\cos(n\pi)$	$(-1)^n$	$+1$	-1	$+1$	$+1$
$sen\left(n\frac{\pi}{2}\right)$		0	$(-1)^{\frac{n-1}{2}}$	0	0
$\cos\left(n\frac{\pi}{2}\right)$		$(-1)^{\frac{n}{2}}$	0		
$sen\left[(n \pm 1)\frac{\pi}{2}\right]$		$\pm(-1)^{\frac{n}{2}}$	0		
$\cos\left[(n \pm 1)\frac{\pi}{2}\right]$		0	$\pm(-1)^{\frac{n+1}{2}}$		
$sen\left[(2n \pm 1)\frac{\pi}{2}\right]$	$\pm(-1)^n$				
$\cos\left[(2n \pm 1)\frac{\pi}{2}\right]$	0				
$e^{\pm j2\pi n}$	1	1	1		
$e^{\pm j\pi n}$	$(-1)^n$	$+1$	-1		
$e^{j\frac{\pi n}{2}}$		$(-1)^{\frac{n}{2}}$	$j(-1)^{\frac{n-1}{2}}$		
$e^{\pm j(2n-1)\pi}$	-1				

PROPIEDADES DE LA FUNCIÓN IMPULSO

$\int_{-\infty}^{\infty} ¢(t)\,dt = 1$	$¢(t-²) = \frac{d}{dt}\left[u(t-²)\right]$
$\int_{-\infty}^{\infty} x(t)¢(t-²)\,dt = x(²)$	$¢(a\cdot t) = \frac{1}{\lvert a\rvert}¢(t)$
$\int_{-\infty}^{\infty} ¢^{(n)}(t)\,dt = 0 \quad n \le 0 \quad n \in Z$	$\left[f(t)\cdot¢(t)\right]' = f(t)¢'(t) + f'(t)¢(t)$
$\int_{-\infty}^{\infty} x(t)¢(at)\,dt = \frac{1}{\lvert a\rvert}x(0)$	$\int_{-\infty}^{\infty} ¨(t)¢^{(n)}(t-²)\,dt = (-1)^n ¨^{(n)}(²)$
$\int_a^b ¨(t)¢^{(n)}(t\pm²)\,dt = \begin{cases} 0 & b<²<a \\ ¨(\mp²) & a \le ² \le b \end{cases}$	$x(t)¢^{(n)}(t\pm²) = \sum_{k=0}^{n}\binom{n}{k}(-1)^{n-k}x^{(n-k)}(-²)¢^{(k)}(t\pm²)$
$¢(-t) = ¢(t)$	$t\cdot¢'(t) = -¢(t)$
$t\cdot¢(t) = 0$	

PROPIEDADES DE LA SERIE DE FOURIER DE TIEMPO CONTINUO

$f(t)$ y $g(t)$ señales periódicas de periodo T y frecuencia fundamental $w_0 = \frac{2®}{T}$, con ~ y constantes

f_n y g_n coeficientes de la serie compleja de Fourier de $f(t)$ y $g(t)$ respectivamente

d_n Coeficiente de la serie de Fourier resultado de aplicar la propiedad

PROPIEDAD	SEÑAL	COEFICIENTE $d_n =$
Linealidad	$\sim f(t) + \ g(t)$	$\sim f_n + \ g_n$
Desplazamiento en el tiempo	$f(t \mp t_0)$	$e^{\mp jnw_0t_0} f_n$
Desplazamiento en frecuencia	$e^{jMw_0t} = e^{jM\frac{2®}{T}} f(t)$	f_{n-M}
Conjugación	$\overline{f}(t)$	$\overline{f}_{-n}$
Inversión en el tiempo	$f(-t)$	f_{-n}
Escalamiento en el tiempo	$f(\sim t) \quad \sim > 0 \quad T = \frac{T}{a}$	f_n
Cambio de periodo	$f_T(t) \to f_{nT}(t)$	$\begin{cases} f_{\frac{n}{m}} & \frac{n}{m} \text{ es un entero} \\ 0 & \text{otro caso} \end{cases}$ con periodo mT
Convolucion periódica	$\int_T f(t)g(t-²)\,d²$	Tf_ng_n
	$\frac{1}{T}\int_T s(t)e^{-jnw_0t}dt$	f_ng_n
Multiplicación	$f(t)g(t)$	$\sum_{m=-\infty}^{\infty} f_mg_{n-m} = f_n \otimes g_n$
Diferenciación	$f'(t) = \frac{d\,f(t)}{dt}$	$(jnw_0)\,f_n \quad n \ne 0$
Integración	$\int_{-\infty}^{t} f(²)\,d² \quad \Leftrightarrow \quad f_0 = 0$	$\begin{cases} \frac{1}{jnw_0} f_n & n \ne 0 \\ -\sum_{n=-\infty,\, n\ne0}^{\infty} \frac{(-1)^n}{jnw_0} f_n & n = 0 \end{cases}$

Simetría conjugada para señales reales	$f(t) \in \mathrm{IR}$	$\begin{cases} f_n = \overline{f}_{-n} \\ \mathrm{Re}(f_n) = \mathrm{Re}(f_{-n}) \\ \mathrm{Im}(f_n) = -\mathrm{Im}(f_{-n}) \end{cases}$ $\begin{cases} \lvert f_n \rvert = \lvert f_{-n} \rvert \\ ¤_n = -¤_{-n} \end{cases}$
Señal real y par	$f(t) \in \mathrm{IR}$ y par	$f_n \in \mathrm{IR}$ y par
Señal real e impar	$f(t) \in \mathrm{IR}$ e impar	$f_n \in \mathrm{Im}$ e impar
Descomposición par e impar de señales reales	$f_P(t) \in \mathrm{IR}$ $f_I(t) \in \mathrm{IR}$	$\mathrm{Re}(f_n)$ $-j\,\mathrm{Im}(f_n)$
Teorema de Parseval	$\frac{1}{T}\int_{-T/2}^{T/2}\left[f(t)\right]^2 dt = \frac{1}{4}a_0^2 + \frac{1}{2}\sum_{n=1}^{\infty}\left(a_n^2 + b_n^2\right)$ para serie trigonometrica $\frac{1}{T}\int_T \lvert f(t)\rvert^2 dt = \sum_{n=-\infty}^{\infty}\lvert f_n\rvert^2 = f_0 + \frac{1}{2}\sum_{n=1}^{\infty}\lvert f_n\rvert^2$ para la serie exponencial	

TABLA DE SERIES DE FOURIER

SEÑAL	SERIE TRIGONOMÉTRICA
$f(t) = t \quad -® < t < ®$	$f(t) = 2\sum_{n=1}^{\infty}\frac{(-1)^{n+1}}{n} sen(nt)$
$f(t) = \lvert t \rvert \quad -® < t < ®$	$f(t) = \frac{®}{2} - \frac{4}{®}\sum_{n=1}^{\infty}\frac{\cos\left[(2n-1)t\right]}{(2n-1)^2}$
$f(t) = ® - t \quad 0 < t < 2®$	$f(t) = 2\sum_{n=1}^{\infty}\frac{sen(nt)}{n}$
$f(t) = \begin{cases} 0 & -® < t < 0 \\ t & 0 < t < ® \end{cases}$	$f(t) = \frac{®}{4} - \frac{2}{®}\sum_{n=1}^{\infty}\frac{\cos\left[(2n-1)t\right]}{(2n-1)^2} + \sum_{n=1}^{\infty}\frac{(-1)^{n+1}}{n} sen(nt)$
$f(t) = \begin{cases} -1 & -® < t < 0 \\ 1 & 0 < t < ® \end{cases}$	$f(t) = \frac{4}{®}\sum_{n=1}^{\infty}\frac{sen\left[(2n-1)t\right]}{2n-1}$
$f(t) = \begin{cases} 0 & -® < t < 0 \\ 1 & 0 < t < ® \end{cases}$	$f(t) = \frac{1}{2} + \frac{2}{®}\sum_{n=1}^{\infty}\frac{sen\left[(2n-1)t\right]}{2n-1}$
$f(t) = \lvert sen(t) \rvert \quad -® < t < ®$	$f(t) = \frac{2}{®} - \frac{4}{®}\sum_{n=1}^{\infty}\frac{\cos(2nt)}{4n^2-1}$
$f(t) = \lvert \cos(t) \rvert \quad -® < t < ®$	$f(t) = \frac{2}{®} - \frac{4}{®}\sum_{n=1}^{\infty}\frac{(-1)^n\cos(2nt)}{4n^2-1}$
$f(t) = \begin{cases} 0 & -® < t < 0 \\ sen(t) & 0 < t < ® \end{cases}$	$f(t) = \frac{1}{®} - \frac{2}{®}\sum_{n=1}^{\infty}\frac{\cos(2nt)}{4n^2-1} - \frac{1}{2}sen(t)$
ONDA PERIÓDICA	**COEFICIENTE DE FOURIER**
$f(t) = \sum_{m=-\infty}^{\infty} A\Pi\left(\frac{t-mT}{²}\right)$ ² anchura del pulso	$f_n = A\frac{sen\left(nw_0\frac{²}{2}\right)}{®n} = \frac{A²}{T}\sin c\left(\frac{nw_0²}{2®}\right)$

$f(t)=\sum_{m=-\infty}^{\infty} A\Pi\left(\frac{t-mT}{²}\right)\cos\left(w_p t\right)$	$f_n=\frac{A²}{2T}\left\{\sin c\left[\left(\frac{nw_0-w_p}{2®}\right)²\right]+\sin c\left[\left(\frac{nw_0+w_p}{2®}\right)²\right]\right\}$
$f(t)=\sum_{m=-\infty}^{\infty} A\Delta\left(\frac{t-mT}{2²}\right)$ 2² anchura del pulso	$f_n=\frac{A²}{T}\sin c^2\left(\frac{nw_0²}{2®}\right)$
$f(t)=\sum_{n=-\infty}^{\infty}(t-nT)$	$f_n=\frac{1}{T}\quad\forall n$