Desarrollos en serie:

$$exp(z) = 1 + z + \frac{z^2}{2!} + \cdots + \frac{z^n}{n!} + \cdots$$

$$senz = z - \frac{z^3}{3!} + \cdots + (-1)^n \frac{z^{2n+1}}{(2n+1)!} + \cdots$$

$$cosz = 1 - \frac{z^2}{2!} + \cdots + (-1)^n \frac{z^{2n}}{(2n)!} + \cdots$$

$$log_0(1+z) = z - \frac{z^2}{2} + \cdots + (-1)^{n+1} \frac{z^n}{n} + \cdots$$

Algunas fórmulas de interés:

$$cosz = \frac{1}{2}(exp(iz) + exp(-iz)) \quad senz = \frac{1}{2i}(exp(iz) - exp(-iz)) \quad exp(iz) = cosz + i\,senz$$

Funciones hiperbólicas:

$$senhz = \frac{1}{2}(exp(z) - exp(-z)) \quad coshz = \frac{1}{2}(exp(z) + exp(-z))$$

Raíces: $\sqrt[n]{z} = |z|^{\frac{1}{n}} \exp(i\frac{\arg(z) + 2k\pi}{n}) \quad , 0 \leq k \leq n-1$

Logaritmo:

$$log(z) = Ln(|z|) + i(arg(z) + 2k\pi) \quad , \quad k \in \mathbb{Z}f$$

$$log_\alpha(z) = Ln(|z|) + i\,arg_\alpha(z) \quad , \qquad arg_\alpha(z) \in (\alpha - \pi, \alpha + \pi)$$

Condiciones de Cauchy-Riemann: $z = x + iy$, $f(z) = u(x,y) + i\,v(x,y)$

$$\left.\begin{array}{r} \frac{\partial u}{\partial x}(x,y) = \frac{\partial v}{\partial y}(x,y) \\ \frac{\partial u}{\partial y}(x,y) = -\frac{\partial v}{\partial x}(x,y) \end{array}\right\} \qquad f'(z) = \frac{\partial u}{\partial x}(x,y) + i\,\frac{\partial v}{\partial x}(x,y)$$

Fórmula de Cauchy: f analítica en $D(a,R)$, $R > 0$, $z \in D(a,R)$

$$f^{n)}(z) = \frac{n!}{2\pi i} \int_{C(a,r)} \frac{f(w)}{(w-z)^{n+1}} dw \qquad , \quad \forall 0 < r < R$$

Serie de Fourier: $f$ de periodo $T$

$$a_n = \frac{2}{T} \int_{-T/2}^{T/2} f(x) \cos(\frac{2\pi nx}{T})\,dx \qquad b_n = \frac{2}{T} \int_{-T/2}^{T/2} f(x) \operatorname{sen}(\frac{2\pi nx}{T})\,dx$$

$$f(x) \sim \frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos(\frac{2\pi nx}{T}) + b_n \operatorname{sen}(\frac{2\pi nx}{T}))$$

Forma compleja:

$$f(x) \sim \sum_{n=-\infty}^{\infty} c_n e^{i2\pi nx/T}, \ n \in \mathbb{Z}, \ c_n = \frac{2}{T} \int_{-T/2}^{T/2} f(x) e^{-i2\pi nx/T}\,dx$$

$$c_0 = \frac{a_0}{2}, \qquad c_n = \frac{a_n - ib_n}{2}, \qquad c_{-n} = \overline{c_n} = \frac{a_n + ib_n}{2} \text{ ,para } n \in \mathbb{N}$$

Transformada de Fourier

$$\hat{f}(s) = \int_{\mathbb{R}} e^{-ist} f(t)\, dt$$

Reglas para transformadas

- Si $g(t) = f(t - t_0) \to \hat{g}(s) = e^{-ist_0}\hat{f}(s)$
- Si $g(t) = f(\alpha t) \to \hat{g}(s) = \frac{1}{|\alpha|}\hat{f}(\frac{s}{\alpha})$
- Si $g(x) = \cos(cs) f(x) \to \hat{g}(s) = \frac{1}{2}\left(\hat{f}(s-c) + \hat{f}(s+c)\right)$
- Si $h(x) = \operatorname{sen}(cx) f(x) \to \hat{h}(s) = \frac{1}{2i}\left(\hat{f}(s-c) - \hat{f}(s+c)\right)$
- $\widehat{f'}(s) = (is)\hat{f}(s)$
- Si $h = f * g \to \hat{h}(s) = \hat{f}(s) \cdot \hat{g}(s)$

Convolución: $(f * g)(x) = \int_{\mathbb{R}} f(t) g(x-t)\, dt$

| TABLA DE ALGUNAS TRANSFORMADAS | |
|---|---|
| $H(t-a) - H(t-b),\ a < b$ | $\frac{e^{-ias} - e^{-ibs}}{is}$ |
| $H(t+b) - H(t-b),\ b > 0$ | $\frac{2\operatorname{sen}(bs)}{s}$ |
| $e^{-at}H(t),\ a > 0$ | $\frac{1}{a+is}$ |
| $e^{-a\|t\|},\ a > 0$ | $\frac{2a}{s^2+a^2}$ |
| $\frac{1}{t^2+c^2},\ c > 0$ | $\frac{\pi}{c}e^{-c\|s\|}$ |
| $e^{-at^2},\ a > 0$ | $\sqrt{\frac{\pi}{a}}e^{-\frac{s^2}{4a}}$ |

Transformada inversa de Fourier:

$$f(t) = \frac{1}{2\pi}\int_{\mathbb{R}} e^{ist} g(s)\, ds$$