Handy Formulas

$$S(t)=\frac{a_0}{2}+\sum_{n=1}^{\infty}\left(a_n\cos(nt)+b_n\sin(nt)\right)$$

$$\begin{cases} a_n=\dfrac{1}{\pi}\displaystyle\int_{-\pi}^{\pi}u(t).\cos(nt)\,dt & n=0,1,2,\ldots\ldots \\ b_n=\dfrac{1}{\pi}\displaystyle\int_{-\pi}^{\pi}u(t).\sin(nt)\,dt & n=1,2,\ldots\ldots \end{cases}$$

$$\boldsymbol{f}(z)=\sum_{\boldsymbol{n}=0}^{\infty}\boldsymbol{a_n}(z-z_0)^{\boldsymbol{n}}+\sum_{\boldsymbol{n}=1}^{\infty}\frac{\boldsymbol{b_n}}{(z-z_0)^{\boldsymbol{n}}}\qquad\left(\boldsymbol{R}_1<|z-z_0|<\boldsymbol{R}_2\right)$$

$$\boldsymbol{a_n}=\frac{1}{2\pi\boldsymbol{i}}\int\frac{\boldsymbol{f}(z)}{(z-z_0)^{\boldsymbol{n}+1}}\boldsymbol{dz}\qquad(\boldsymbol{n}=0,1,2\ldots)$$

$$\boldsymbol{b_n}=\frac{1}{2\pi\boldsymbol{i}}\int\frac{\boldsymbol{f}(z)}{(z-z_0)^{-\boldsymbol{n}+1}}\boldsymbol{dz}\qquad(\boldsymbol{n}=1,2\ldots)$$

$$\boldsymbol{f}(z)=\sum_{\boldsymbol{n}=-\infty}^{\infty}\boldsymbol{c_n}(z-z_0)^{\boldsymbol{n}}\qquad\left(\boldsymbol{R}_1<|z-z_0<\boldsymbol{R}_2|\right)$$

$$\boldsymbol{c_n}=\frac{1}{2\pi\boldsymbol{i}}\bigcirc\qquad(\boldsymbol{n}=0,\pm1,\pm2,\ldots.)$$

$$\boldsymbol{f}(z)=\sum_{\boldsymbol{n}=0}^{\infty}\boldsymbol{a_n}(z-z_0)^{\boldsymbol{n}}\quad|z-z_{\boldsymbol{o}}|<\boldsymbol{R}_0\qquad\boldsymbol{a_n}=\frac{\boldsymbol{f}^{\boldsymbol{n}}(z_0)}{\boldsymbol{n}!},\qquad(\boldsymbol{n}=0,1,2\ldots)$$

$$\mathrm{Re}\,z(\boldsymbol{f};z_0)=\lim_{z\to z_0}\frac{1}{(\boldsymbol{n}-1)!}\frac{\boldsymbol{d}^{\boldsymbol{n}-1}}{\boldsymbol{dz}^{\boldsymbol{n}-1}}[(z-z_0)^{\boldsymbol{n}}\boldsymbol{f}(z)]$$

$$\boldsymbol{A_K}=\frac{1}{(\boldsymbol{n}-\boldsymbol{k})!}\lim_{\boldsymbol{s}\to\boldsymbol{a}}\frac{\boldsymbol{d}^{\boldsymbol{n}-\boldsymbol{k}}}{\boldsymbol{ds}^{\boldsymbol{n}-\boldsymbol{k}}}\left[\frac{\boldsymbol{P}(\boldsymbol{s})}{\boldsymbol{Q}(\boldsymbol{s})}\right]\qquad\frac{1}{2\pi\boldsymbol{i}}\bigcirc\qquad-\boldsymbol{p}$$

$$L\left(f(t)\right)=F(s)=\int_0^{\infty}f(t)e^{-st}dt\qquad L^{-1}\left(F(s)\right)=f(t)=\frac{1}{2\pi i}\int_{\sigma-i\infty}^{\sigma+i\infty}F(s)e^{st}ds$$

$$e^{at}f(t)\;\Leftrightarrow\;F(s-a)\qquad t^nf(t)\;\Leftrightarrow\;(-1)^n\frac{d^n}{ds^n}F(s)\qquad f(t-a)u(t-a)\;\Leftrightarrow\;e^{-as}F(s)\qquad u(t-a)\leftrightarrow\frac{e^{-as}}{s}$$

$$t^n\;\leftrightarrow\;\frac{n!}{s^{n+1}}\qquad e^{at}\;\leftrightarrow\;\frac{1}{s-a}\qquad\sin(kt)\leftrightarrow\frac{k}{s^2+k^2}\qquad\cos(kt)\leftrightarrow\frac{s}{s^2+k^2}$$