APPENDICE A

Tabelle

A.1 Derivate notevoli

$y = k$	$\frac{dy}{dx} = 0$	$y = x$	$\frac{dy}{dx} = 1$
$y = x^n$	$\frac{dy}{dx} = nx^{n-1}$	$y = \left[f(x) \right]^n$	$\frac{dy}{dx} = n\left[f(x) \right]^{n-1} \frac{df(x)}{dx}$
$y = \sqrt{x}$	$\frac{dy}{dx} = \frac{1}{2\sqrt{x}}$	$y = \sqrt{f(x)}$	$\frac{dy}{dx} = \frac{1}{2\sqrt{f(x)}} \frac{df(x)}{dx}$
$y = \sqrt[n]{x}$	$\frac{dy}{dx} = \frac{1}{n\sqrt[n]{x^{n-1}}}$	$y = \sqrt[n]{f(x)}$	$\frac{dy}{dx} = \frac{1}{n\sqrt[n]{f(x)^{n-1}}} \frac{df(x)}{dx}$
$y = \sqrt[n]{x^m}$	$\frac{dy}{dx} = \frac{m}{n\sqrt[n]{x^{n-m}}}$	$y = \sqrt[n]{\left[f(x) \right]^m}$	$\frac{dy}{dx} = \frac{m}{n\sqrt[n]{\left[f(x) \right]^{n-m}}} \frac{df(x)}{dx}$
$y = \sin x$	$\frac{dy}{dx} = \cos x$	$y = \sin f(x)$	$\frac{dy}{dx} = \cos f(x) \frac{df(x)}{dx}$
$y = \cos x$	$\frac{dy}{dx} = -\sin x$	$y = \cos f(x)$	$\frac{dy}{dx} = -\sin f(x) \frac{df(x)}{dx}$
$y = \tan x$	$\frac{dy}{dx} = \frac{1}{\cos^2 x}$	$y = \tan f(x)$	$\frac{dy}{dx} = \frac{1}{\cos^2 f(x)} \frac{df(x)}{dx}$
$y = \cot x$	$\frac{dy}{dx} = -\frac{1}{\sin^2 x}$	$y = \cot f(x)$	$\frac{dy}{dx} = -\frac{1}{\sin^2 f(x)} \frac{df(x)}{dx}$
$y = \arcsin x$	$\frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}}$	$y = \arcsin f(x)$	$\frac{dy}{dx} = \frac{1}{\sqrt{1-\left[f(x) \right]^2}} \frac{df(x)}{dx}$
$y = \arccos x$	$\frac{dy}{dx} = -\frac{1}{\sqrt{1-x^2}}$	$y = \arccos f(x)$	$\frac{dy}{dx} = -\frac{1}{\sqrt{1-\left[f(x) \right]^2}} \frac{df(x)}{dx}$
$y = \arctan x$	$\frac{dy}{dx} = \frac{1}{1-x^2}$	$y = \arctan f(x)$	$\frac{dy}{dx} = \frac{1}{1+\left[f(x) \right]^2} \frac{df(x)}{dx}$
$y = \operatorname{arccot} x$	$\frac{dy}{dx} = -\frac{1}{1-x^2}$	$y = \operatorname{arccot} f(x)$	$\frac{dy}{dx} = -\frac{1}{1+\left[f(x) \right]^2} \frac{df(x)}{dx}$
$y = \log_a x$	$\frac{dy}{dx} = \frac{1}{x} \log_a e$	$y = \log_a f(x)$	$\frac{dy}{dx} = \frac{1}{f(x)} \log_a e \frac{df(x)}{dx}$
$y = \ln x$	$\frac{dy}{dx} = \frac{1}{x}$	$y = \ln f(x)$	$\frac{dy}{dx} = \frac{1}{f(x)} \frac{df(x)}{dx}$
$y = a^x$	$\frac{dy}{dx} = a^x \ln a$	$y = a^{f(x)}$	$\frac{dy}{dx} = a^{f(x)} \ln a \frac{df(x)}{dx}$
$y = e^x$	$\frac{dy}{dx} = e^x$	$y = e^{f(x)}$	$\frac{dy}{dx} = e^{f(x)} \frac{df(x)}{dx}$
$y = x^x$	$\frac{dy}{dx} = x^x (1+\ln x)$	$y = \left[f(x) \right]^{g(x)}$	$\frac{dy}{dx} = \left[f(x) \right]^{g(x)} \left[\frac{dg(x)}{dx} \ln f(x) + \frac{g(x)}{f(x)} \frac{df(x)}{dx} \right]$

A.2 Integrali notevoli

$\int_{x_0}^{x} d\xi = x - x_0$	$\int_{x_0}^{x} k\, f(\xi)\, d\xi = k \int_{x_0}^{x} f(\xi)\, d\xi$
$\int_{x_0}^{x} \xi^n\, d\xi = \frac{x^{n+1}}{n+1} - \frac{x_0^{\,n+1}}{n+1} \qquad (n \neq -1)$	$\int_{x_0}^{x} \left[f(\xi) \right]^n \frac{df(\xi)}{d\xi} d\xi = \frac{\left[f(x) \right]^{n+1}}{n+1} - \frac{\left[f(x_0) \right]^{n+1}}{n+1}$
$\int_{x_0}^{x} \frac{1}{2\sqrt{\xi}} d\xi = \sqrt{x} - \sqrt{x_0}$	$\int_{x_0}^{x} \frac{1}{2\sqrt{f(\xi)}} \frac{df(\xi)}{d\xi} d\xi = \sqrt{f(x)} - \sqrt{f(x_0)}$
$\int_{x_0}^{x} \sin\xi\, d\xi = -(\cos x - \cos x_0)$	$\int_{x_0}^{x} \sin f(\xi) \frac{df(\xi)}{d\xi} d\xi = -\left[\cos f(x) - \cos f(x_0) \right]$
$\int_{x_0}^{x} \cos\xi\, d\xi = (\sin x - \sin x_0)$	$\int_{x_0}^{x} \cos f(\xi) \frac{df(\xi)}{d\xi} d\xi = \left[\sin f(x) - \sin f(x_0) \right]$
$\int_{x_0}^{x} \frac{1}{\sin^2 \xi} d\xi = -(\cot x - \cot x_0)$	$\int_{x_0}^{x} \frac{1}{\sin^2 f(\xi)} \frac{df(\xi)}{d\xi} d\xi = -\left[\cot f(x) - \cot f(x_0) \right]$
$\int_{x_0}^{x} \frac{1}{\cos^2 \xi} d\xi = (\tan x - \tan x_0)$	$\int_{x_0}^{x} \frac{1}{\cos^2 f(\xi)} \frac{df(\xi)}{d\xi} d\xi = \left[\tan f(x) - \tan f(x_0) \right]$
$\int_{x_0}^{x} \frac{1}{\sqrt{1-\xi^2}} d\xi = \arcsin x - \arcsin x_0$	$\int_{x_0}^{x} \frac{1}{\sqrt{1-\left[f(\xi) \right]^2}} \frac{df(\xi)}{d\xi} d\xi = \arcsin f(x) - \arcsin f(x_0)$
$\int_{x_0}^{x} \frac{1}{1+\xi^2} d\xi = \arctan x - \arctan x_0$	$\int_{x_0}^{x} \frac{1}{1+\left[f(\xi) \right]^2} \frac{df(\xi)}{d\xi} d\xi = \arctan f(x) - \arctan f(x_0)$
$\int_{x_0}^{x} \frac{1}{\xi} d\xi = \ln\lvert x \rvert - \ln\lvert x_0 \rvert$	$\int_{x_0}^{x} \frac{1}{f(\xi)} \frac{df(\xi)}{d\xi} d\xi = \ln\lvert f(x) \rvert - \ln\lvert f(x_0) \rvert$
$\int_{x_0}^{x} e^{\xi}\, d\xi = e^{x} - e^{x_0}$	$\int_{x_0}^{x} e^{f(\xi)} \frac{df(\xi)}{d\xi} d\xi = e^{f(x)} - e^{f(x_0)}$
$\int_{x_0}^{x} a^{\xi}\, d\xi = \frac{a^x}{\ln a} - \frac{a^{x_0}}{\ln a}$	$\int_{x_0}^{x} a^{f(\xi)} \frac{df(\xi)}{d\xi} d\xi = \frac{a^{f(x)}}{\ln a} - \frac{a^{f(x_0)}}{\ln a}$
$\int_{x_0}^{x} (\xi + a)^m\, d\xi = \frac{(x+a)^{m+1}}{m+1} - \frac{(x_0+a)^{m+1}}{m+1}$	$\int_{x_0}^{x} \frac{1}{a^2+\xi^2} d\xi = \frac{1}{a}\arctan\left(\frac{x}{a}\right) - \frac{1}{a}\arctan\left(\frac{x_0}{a}\right)$
$\int_{x_0}^{x} (a + b\xi)^n\, d\xi = \frac{(a+bx)^{n+1}}{b(n+1)} - \frac{(a+bx_0)^{n+1}}{b(n+1)}$	$\int_{x_0}^{x} \frac{1}{1-\xi^2} d\xi = \frac{1}{2}\ln\left\lvert\frac{1+x}{1-x}\right\rvert - \frac{1}{2}\ln\left\lvert\frac{1+x_0}{1-x_0}\right\rvert$
$\int_{x_0}^{x} \tan\xi\, d\xi = -\left[\ln(\cos x) - \ln(\cos x_0) \right]$	$\int_{x_0}^{x} \cot\xi\, d\xi = \ln\lvert\sin x\rvert - \ln\lvert\sin x_0\rvert$
$\int_{x_0}^{x} \sin^2\xi\, d\xi = \frac{1}{2}(x - \sin x\cos x) - \frac{1}{2}(x_0 - \sin x_0 \cos x_0)$	$\int_{x_0}^{x} \cos^2\xi\, d\xi = \frac{1}{2}(x + \sin x\cos x) - \frac{1}{2}(x_0 + \sin x_0 \cos x_0)$
$\int_{x_0}^{x} \frac{1}{\sin\xi} d\xi = \ln\left\lvert\tan\left(\frac{x}{2}\right)\right\rvert - \ln\left\lvert\tan\left(\frac{x_0}{2}\right)\right\rvert$	$\int_{x_0}^{x} \frac{1}{\cos\xi} d\xi = \frac{1}{2}\ln\left\lvert\frac{1+\sin x}{1-\sin x}\right\rvert - \frac{1}{2}\ln\left\lvert\frac{1+\sin x_0}{1-\sin x_0}\right\rvert$
$\int_{x_0}^{x} \frac{1}{1+\cos\xi} d\xi = \tan\left(\frac{x}{2}\right) - \tan\left(\frac{x_0}{2}\right)$	$\int_{x_0}^{x} \frac{1}{1-\cos\xi} d\xi = -\left[\cot\left(\frac{x}{2}\right) - \cot\left(\frac{x_0}{2}\right) \right]$

A.3 Trasformate di Laplace notevoli

$\delta(t)$	1
$\eta(t)$	$\frac{1}{s}$
t	$\frac{1}{s^2}$
$\frac{t^{n-1}}{(n-1)!}$ $\quad n=1, 2, \ldots$	$\frac{1}{s^n}$
e^{-kt}	$\frac{1}{s+k}$
$\frac{t^{n-1}e^{-kt}}{(n-1)!}$ $\quad n=1, 2, \ldots$	$\frac{1}{(s+k)^n}$
$\frac{(n-1-kt)t^{n-1}e^{-kt}}{(n-1)!}$ $\quad n=1, 2, \ldots$	$\frac{s}{(s+k)^n}$
$\frac{\sin(\omega_0 t)}{\omega_0}$	$\frac{1}{s^2+\omega_0{}^2}$
$\cos(\omega_0 t)$	$\frac{s}{s^2+\omega_0{}^2}$
$\frac{e^{-\sigma_0 t}\sin(\omega_0 t)}{\omega_0}$	$\frac{1}{(s+\sigma_0)^2+\omega_0{}^2}$
$-\frac{e^{-\sigma_0 t}\sin(\omega_0 t-\phi_0)}{\sin\phi_0}$ $\phi_0=\arctan\left(\frac{\omega_0}{\sigma_0}\right)$	$\frac{s}{(s+\sigma_0)^2+\omega_0{}^2}$
$\frac{\sinh(kt)}{k}$	$-\frac{1}{s^2-k^2}$
$\cosh(kt)$	$-\frac{s}{s^2-k^2}$
$\frac{e^{-k_1 t}-e^{-k_2 t}}{k_1-k_2}$	$\frac{1}{(s-k_1)(s-k_2)}$
$\frac{k_1 e^{-k_1 t}-k_2 e^{-k_2 t}}{k_1-k_2}$	$\frac{s}{(s-k_1)(s-k_2)}$
$\frac{\sin(\omega_0 t)-\omega_0 t\cos(\omega_0 t)}{2\omega_0{}^3}$	$\frac{1}{(s^2+\omega_0{}^2)^2}$
$\frac{t\sin(\omega_0 t)}{2\omega_0}$	$\frac{s}{(s^2+\omega_0{}^2)^2}$
$\frac{1}{3k^2}\left[e^{-kt}+2e^{-\frac{kt}{2}}\sin\left(\frac{\sqrt{3}}{2}kt-\frac{\pi}{6}\right)\right]$	$\frac{1}{s^3+k^3}$
$\frac{1}{3k}\left[2e^{-\frac{kt}{2}}\sin\left(\frac{\sqrt{3}}{2}kt+\frac{\pi}{6}\right)-e^{-kt}\right]$	$\frac{s}{s^3+k^3}$

A.4 Costanti fondamentali

Costante	**Simbolo**	**Valore**
Velocità della luce nel vuoto	c	$2.9979\times10^{8}\ m/s$
Carica elementare	e	$1.6021\times10^{-19}\ C$
Massa a riposo dell'elettrone	m_e	$9.1091\times10^{-31}\ kg$
Massa a riposo del protone	m_p	$1.6725\times10^{-27}\ kg$
Massa a riposo del neutrone	m_n	$1.6748\times10^{-27}\ kg$
Costante di Planck	h	$6.6256\times10^{-34}\ J\ s$
	$\hbar = h/2\pi$	$1.0545\times10^{-34}\ J\ s$
Rapporto carica/massa dell'elettrone	e/m_e	$1.7588\times10^{11}\ C/kg$
Raggio di Bohr	a_0	$5.2917\times10^{-11}\ m$
Costante di Rydberg	R	$1.0974\times10^{7}\ 1/m$
Magnetone di Bohr	μ_B	$9.2732\times10^{-24}\ J/T$
Costante di Avogadro	N_A	$6.0225\times10^{23}\ 1/mol$
Costante di Boltzmann	k	$1.3805\times10^{-23}\ J/K$
Costante dei gas	R	$8.3143\ J/K\ mol$
Volume molare	V_m	$2.2414\times10^{-2}\ m^3/mol$
Costante gravitazionale	G	$6.670\times10^{-11}\ N\ m^2/kg^2$
Accelerazione di gravità media a livello del mare all'equatore	g	$9.7805\ m/s^2$
Costante di Faraday	F	$9.6487\times10^{4}\ C/mol$
Costante dielettrica del vuoto	ε_0	$8.8544\times10^{-12}\ C^2/N\ m^2$
Permeabilità magnetica del vuoto	μ_0	$1.2566\times10^{-6}\ m\,kg/C^2$
Costante di Coloumb	$k = 1/4\pi\varepsilon_0$	$8.9874\times10^{9}\ N\ m^2/C^2$