Bernoulli-Ungl. $(1+x)^n \geq 1+nx$

$e^{\ln x} = x \qquad \ln(e^x) = x$

$$(x+y)^n = \sum_{k=0}^{n} \binom{n}{k} x^{n-k} y^k$$
$$ar\sinh = \ln(x+\sqrt{x^2+1})$$
$$ar\cosh = \ln(x+\sqrt{x^2-1})$$
$$\ln(xy) = \ln(x)+\ln(y)$$
$$\text{Mittelwertsatz } f'(x_0) = \frac{f(b)-f(a)}{b-a}$$
$$\sum_{i=0}^{\infty} \frac{x^i}{i!} = e^x$$
$$\binom{n}{k} = \frac{n!}{k!(n-k)!}$$

Taylor: $T_n(f;x) := \sum_{k=0}^{n} \frac{f^{(k)}(a)}{k!}(x-a)^k$

Potenzgesetze

$a^p \cdot a^r = a^{p+r} \qquad a^p \cdot b^p = (ab)^p$

$\frac{a^p}{a^r} = a^{p-r} \qquad \frac{a^p}{b^p} = (\frac{a}{b})^p$

$(a^p)^r = a^{pr}$

Differentiation

$(f+g)' = f'+g'$

Produktregel: $(f \cdot g)' = f' \cdot g + f \cdot g'$

Quotientenregel: $(\frac{f}{g})' = \frac{f' \cdot g - f \cdot g'}{g^2}$

Kettenregel: $(f \circ g)' = g' \cdot f'(g(x))$

$(f^{-1})' = \frac{1}{f'(f^{-1}(x))}$

$$\frac{2}{3a}(ax+b)^{\frac{3}{2}} \quad ()' = \sqrt{ax+b}$$
$$\frac{a^x}{\ln a} \quad ()' = a^x$$
$$x(\ln(x)-1) \quad ()' = \ln x$$
$$\frac{1}{x^n} \quad ()' = -\frac{n}{x^{n+1}}$$
$$\sqrt{x} \quad ()' = \frac{1}{2\sqrt{x}}$$
$$\sqrt[n]{x} \quad ()' = \frac{1}{n\sqrt[n]{x^{n-1}}}$$
$$\ln x \quad ()' = \frac{1}{x}$$
$$a^x \quad ()' = a^x \ln a$$
$$tanx \quad ()' = \frac{1}{\cos^2 x} = 1+\tan^2 x$$
$$\cot x \quad ()' = -\frac{1}{\sin^2 x} = -1-\cot^2 x$$
$$\arcsin x \quad ()' = \frac{1}{\sqrt{1-x^2}}$$
$$\arccos x \quad ()' = -\frac{1}{\sqrt{1-x^2}}$$
$$\arctan x \quad ()' = \frac{1}{1+x^2}$$
$$\text{arccot} x \quad ()' = -\frac{1}{1+x^2}$$
$$\sinh x \quad ()' = \cosh x$$
$$\cosh x \quad ()' = \sinh x$$
$$\tanh x \quad ()' = \frac{1}{\cosh^2 x} = 1-\tanh^2 x$$
$$\coth x \quad ()' = -\frac{1}{\sinh^2 x} = 1-\coth^2 x$$
$$ar\sinh x \quad ()' = \frac{1}{\sqrt{x^2+1}}$$
$$ar\cosh x \quad ()' = \frac{1}{\sqrt{x^2-1}}$$
$$ar\tanh x \quad ()' = \frac{1}{1-x^2}$$
$$ar\coth x \quad ()' = \frac{1}{1-x^2}$$

Integration

partielle Integration $\int uv' = uv - \int u'v$

$$\int (ax+b)^n = \frac{(ax+b)^{n+1}}{a(n+1)} = \frac{1}{a}\ln|ax+b|$$
$$\int \ln x = x\ln x - x \qquad \forall x > 0$$
$$\int (\ln x)^n = x(\ln x)^n - n\int(\ln x)^2$$
$$\int \frac{1}{x}\ln x = \frac{1}{2}(\ln x)^2$$
$$\int \frac{1}{x\ln x} = \ln|\ln x|$$
$$\int \frac{f'(x)}{f(x)} = \ln|f(x)|$$
$$\int \frac{1}{ax^2+bx+c} = \frac{2}{\sqrt{4ac-b^2}}\arctan\frac{2ax+b}{\sqrt{4ac-b^2}}$$
$$\int \frac{1}{x^2+a^2} = \frac{1}{a}\arctan\frac{x}{a}$$

uneigentliche Integrale

$$\int_a^{\infty} f(x)dx := \lim_{b\to\infty}\int_a^b f(x)dx$$

Konvergenz

Wurzel-Krit. $\lim_{n\to\infty} \sqrt[n]{|u_n|} < 1$

Quotienten-Krit. $\lim_{n\to\infty} |\frac{a_{n+1}}{a_n}| < 1$

$unbestimmbar = 1, divergent > 1$

Leibnitz-Kriterium:

alternierend, konvergent gegen 0, nicht-alternierender Teil muß gegen 0 konvergieren, monoton fallend

Konvergenzradius $\lim_{n\to\infty} |\frac{a_{n+1}}{a_n}| = \frac{1}{R}$

$\lim_{n\to\infty} \sqrt[n]{|u_n|} = \frac{1}{R}$

$\lim_{n\to\infty} \frac{n^n e^{-n}\sqrt{2\pi n}}{n!} = \lim_{n\to\infty} \frac{\frac{n}{e}}{\sqrt[n]{n!}} = 1$

Additionstheoreme etc.

$$\cos(x+y) = \cos x \cdot \cos y - \sin x \cdot \sin y$$
$$\sin(x+y) = \sin x \cdot \cos y + \cos x \cdot \sin y$$
$$\cos^2 x + \sin^2 x = 1$$
$$\cosh^2 x - \sinh^2 x = 1$$
$$\cosh(-x) = \cosh(x)$$
$$\sinh(-x) = -\sinh(x)$$
$$2\sin(x)\cos(x) = \sin(2x)$$
$$2\sinh(x)\cosh(x) = \sinh(2x)$$
$$\cosh(x)+\sinh(x) = e^x$$
$$\cos(2x) = \cos^2(x)-\sin^2(x)$$

"a priori" Absch.: $|x_n - x^*| \leq \frac{L^n}{1-L}|x_0 - x_1|$

Besondere Funktionswerte:

	$0°$	$30°(\frac{\pi}{6})$	$45°(\frac{\pi}{4})$	$60°(\frac{\pi}{3})$	$90°(\frac{\pi}{2})$
sin	0	$\frac{1}{2}$	$\frac{1}{2}\sqrt{2}$	$\frac{1}{2}\sqrt{3}$	1
cos	1	$\frac{1}{2}\sqrt{3}$	$\frac{1}{2}\sqrt{2}$	$\frac{1}{2}$	0
tan	0	$\frac{1}{3}\sqrt{3}$	1	$\sqrt{3}$	–