| | |
|---|---|
| $y = \mathrm{a} + \mathrm{b} \cdot x \Rightarrow \mathrm{b} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x}$ | $\frac{0}{0}$ $\frac{\infty}{\infty}$ $0 \cdot \infty$ $\infty - \infty$ $0^0$ $1^\infty$ $\infty^0$ |
| $0 \cdot const = 0$ $\infty \cdot const = \infty$ $\frac{const}{0} = \infty$ $\frac{const}{\infty} = 0$ $const^\infty = \infty$ $const \pm \infty = \pm\infty$ | |
| $const + \infty = \infty$ $const - \infty = -\infty$ $const^\infty = \infty$ | |

| | | | |
|---|---|---|---|
| $y = \mathrm{a}^x, \mathrm{a} > 0$ | $x^0 = 1$ | $x^\mathrm{a} \cdot x^\mathrm{b} = x^{\mathrm{a}+\mathrm{b}}$ | $\frac{x^\mathrm{a}}{x^\mathrm{b}} = x^{\mathrm{a}-\mathrm{b}}$ |
| $(x^\mathrm{a})^\mathrm{b} = x^{\mathrm{a}\cdot\mathrm{b}}$ | $x^{\frac{\mathrm{a}}{\mathrm{b}}} = \left(\sqrt[\mathrm{b}]{x}\right)^\mathrm{a} = \sqrt[\mathrm{b}]{x^\mathrm{a}}$ | $x^{-\mathrm{a}} = \frac{1}{x^\mathrm{a}}$ | |

| | | | |
|---|---|---|---|
| $y = \log_\mathrm{a}(x), \mathrm{a} > 0 \text{ i } \mathrm{a} \neq 1, x > 0$ | $\log_\mathrm{a}(x) = y \Leftrightarrow x = \mathrm{a}^y$ | $\log_\mathrm{a}(x \cdot y) = \log_\mathrm{a}(x) + \log_\mathrm{a}(y)$ | |
| $\log_\mathrm{a}\left(\frac{x}{y}\right) = \log_\mathrm{a}(x) - \log_\mathrm{a}(y)$ | $\log_\mathrm{a}[(x)^\mathrm{n}] = \mathrm{n} \cdot \log_\mathrm{a}(x)$ | $\log_\mathrm{a}(x) = \frac{\log_\mathrm{b}(x)}{\log_\mathrm{b}(a)}$ | $\log_\mathrm{e}(x) = \ln(x)$<br>$\log_{10}(x) = \log(x)$ |

| | | |
|---|---|---|
| $a_1 + a_2 + a_3 + \cdots + a_n = \sum_{i=1}^{n} a_i = \sum_{1}^{n} a_i$ | $n! = 1 \cdot 2 \cdot 3 \cdot \ldots (n-1) \cdot n$ | $\binom{n}{k} = \frac{n!}{k! \cdot (n-k)!}$ |
| $(x+y)^n = \binom{n}{0} \cdot x^n \cdot y^0 + \binom{n}{1} \cdot x^{n-1} \cdot y^1 + \binom{n}{2} \cdot x^{n-2} \cdot y^2 + \cdots + \binom{n}{n-1} \cdot x^{n-(n-1)} \cdot y^{n-1} + \binom{n}{n} \cdot x^{n-n} \cdot y^n$ | | |

| | | | | |
|---|---|---|---|---|
| $p.w.s\,[\mathrm{a};\mathrm{b}] = \frac{f(\mathrm{b}) - f(\mathrm{a})}{\mathrm{b} - \mathrm{a}} = \frac{\Delta f}{\Delta x}$ | $f'(\mathrm{a}) = \frac{\mathrm{d}f}{\mathrm{d}x} = \lim_{\mathrm{b}\to\mathrm{a}}\left(\frac{f(\mathrm{b}) - f(\mathrm{a})}{\mathrm{b} - \mathrm{a}}\right)$ | $f'(\mathrm{a}) = \lim_{\Delta x\to 0}\left(\frac{f(\mathrm{a}+\Delta x) - f(\mathrm{a})}{\Delta x}\right)$ | | |
| $f(x) = \mathrm{a} \cdot g(x)$<br>$\Downarrow$<br>$f'(x) = \mathrm{a} \cdot g'(x)$ | $f(x) = g(x) \pm h(x)$<br>$\Downarrow$<br>$f'(x) = g'(x) \pm h'(x)$ | $h(x) = f(x) \cdot g(x)$<br>$\Downarrow$<br>$h'(x) = f'(x) \cdot g(x) + f(x) \cdot g'(x)$ | | |
| $h(x) = \frac{f(x)}{g(x)} \Rightarrow h'(x) = \frac{f'(x) \cdot g(x) - f(x) \cdot g'(x)}{[g(x)]^2}$ | | $f(x) = z\big(w(x)\big) \Rightarrow f'(x) = z'(w) \cdot w'(x)$ | | |
| $(x^\mathrm{n})' = \mathrm{n} \cdot x^{\mathrm{n}-1}$ | $(\mathrm{a}^x)' = \mathrm{a}^x \cdot \ln(\mathrm{a})$ | $(\mathrm{e}^x)' = \mathrm{e}^x$ | $[\log_\mathrm{a}(x)]' = \frac{1}{x} \cdot \log_\mathrm{a}(\mathrm{e}) = \frac{1}{x \cdot \ln(\mathrm{a})}$ | $[\ln(x)]' = \frac{1}{x}$ |
| $(const)' = 0$ | | $[\cos(x)]' = -\sin(x)$ | | $[\sin(x)]' = \cos(x)$ |
| $[\mathrm{tg}(x)]' = \frac{1}{\cos^2(x)}$ | | $[\mathrm{ctg}(x)]' = -\frac{1}{\sin^2(x)}$ | | |
| $\mathrm{grad}f(x) = \frac{\mathrm{d}f}{\mathrm{d}x} \cdot \hat{x}$ | $\mathrm{grad}f(x,y,z) = \frac{\partial f}{\partial x} \cdot \hat{x} + \frac{\partial f}{\partial y} \cdot \hat{y} + \frac{\partial f}{\partial z} \cdot \hat{z}$ | $\frac{\partial f(x,y)}{\partial x} = \lim_{\Delta x\to 0} \frac{f(x+\Delta x, y) - f(x,y)}{\Delta x}$ | | |

| | | | | |
|---|---|---|---|---|
| $\Delta F = \pm\sum_{\mathrm{i}=1}^{\mathrm{m}} \left\lvert\frac{\partial f}{\partial A_\mathrm{i}}\right\rvert \cdot \Delta A_\mathrm{i}$ | $\Delta f = \lvert f'\rvert \cdot \Delta x = \left\lvert\frac{\mathrm{d}f}{\mathrm{d}x}\right\rvert \cdot \Delta x$ | $y = \mathrm{a} \cdot x + \mathrm{b}$ | $\mathrm{a} = \lim_{x\to\infty}\left[\frac{f(x)}{x}\right]$ | $\mathrm{b} = \lim_{x\to\infty}[f(x) - \mathrm{a} \cdot x]$ |
| $\mathrm{d}y = y' \cdot \mathrm{d}x$ | | $[f'(x)]' = f''(x)$ | | $\left[f^{(\mathrm{n})}(x)\right]' = f^{(\mathrm{n}+1)}(x)$ |
| $f(x) = f(\mathrm{a}) + \sum_{\mathrm{i}=1}^{\infty} \frac{f^{(\mathrm{i})}(\mathrm{a})}{\mathrm{i}!} \cdot (x-a)^\mathrm{i}$ | | $f(x) = f(0) + \sum_{\mathrm{i}=1}^{\infty} \frac{f^{(\mathrm{i})}(0)}{\mathrm{i}!} \cdot x^\mathrm{i}$ | | |
| $v(t) = \frac{\mathrm{d}x}{\mathrm{d}t}$ | $a(t) = \frac{\mathrm{d}v}{\mathrm{d}t}$ | $F(t) = \frac{\mathrm{d}p}{\mathrm{d}t}$ | $F(x) = \frac{\mathrm{d}W}{\mathrm{d}x}$ | $E(x) = -\frac{\mathrm{d}V}{\mathrm{d}x}$ |
| Jeżeli $\lim_{x\to x_0} f(x) = 0$ oraz $\lim_{x\to x_0} g(x) = 0$ lub $\lim_{x\to x_0} f(x) = \infty$ oraz $\lim_{x\to x_0} g(x) = \infty$, to $\lim_{x\to x_0}\left[\frac{f(x)}{g(x)}\right] = \lim_{x\to x_0}\left[\frac{f'(x)}{g'(x)}\right]$ | | | | |

| | | |
|---|---|---|
| $F(x) = \int f(x)\,\mathrm{d}x \Leftrightarrow F'(x) = f(x)$ | $\int c \cdot f(x)\,\mathrm{d}x = c \cdot \int f(x)\,\mathrm{d}x$ | $\int [f(x) + g(x)]\,\mathrm{d}x = \int f(x)\,\mathrm{d}x + \int g(x)\,\mathrm{d}x$ |
| $\int f(x) \cdot g'(x) \cdot \mathrm{d}x = f(x) \cdot g(x) - \int f'(x) \cdot g(x) \cdot \mathrm{d}x$ | | $\int u \cdot \mathrm{d}v = u \cdot v - \int v \cdot \mathrm{d}u$ |

| | | | |
|---|---|---|---|
| $\int x^n\,dx = \frac{1}{n+1}\cdot x^{n+1} + C$ | $\int x^{-1}\,dx = \ln\lvert x\rvert + C$ | $\int a^x\,dx = \frac{a^x}{\ln(a)} + C$ | $\int e^x\,dx = e^x + C$ |
| $\int \ln(x)\,dx = x\cdot\ln(x) - x + C$ | | $\int \sin(x)\,dx = -\cos(x) + C$ | |
| $\int \cos(x)\,dx = \sin(x) + C$ | | $\int \frac{1}{\cos^2(x)}dx = \mathrm{tg}(x) + C$ | |
| $\int_a^b f(x)\,dx = F(x)\lvert_a^b = F(b) - F(a)$ | | $\int_a^b f(x)\,dx = -\int_b^a f(x)\,dx$ | |

| | | |
|---|---|---|
| $i^2 = -1 \Rightarrow \sqrt{-1} = i$ | Dla $z_1 = a_1 + i\cdot b_1$, $z_2 = a_2 + i\cdot b_2$ | $z_1 = z_2 \Leftrightarrow a_1 = a_2 \wedge b_1 = b_2$ |
| | | $z_1 + z_2 = a_1 + a_2 + i\cdot(b_1 + b_2)$ |
| | | $z_1\cdot z_2 = a_1\cdot a_2 - b_1\cdot b_2 + i\cdot(a_1\cdot b_2 + b_1\cdot a_2)$ |

$$z = a + i\cdot b = [r,\varphi] = r\cdot[\cos(\varphi) + i\cdot\sin(\varphi)] = r\cdot e^{i\cdot\varphi},\ \text{gdzie}\ |z| = r = \sqrt{a^2+b^2},\ \cos(\varphi) = \frac{a}{r},\ \sin(\varphi) = \frac{b}{r}$$

Dla $z_1 = [r_1,\varphi_1]$, $z_2 = [r_2,\varphi_2]$

$$z_1\cdot z_2 = [r_1\cdot r_2, \varphi_1+\varphi_2] = r_1\cdot r_2\cdot[\cos(\varphi_1+\varphi_2) + i\cdot\sin(\varphi_1+\varphi_2)]$$

$$\frac{z_1}{z_2} = \left[\frac{r_1}{r_2}, \varphi_1-\varphi_2\right] = \frac{r_1}{r_2}\cdot[\cos(\varphi_1-\varphi_2) + i\cdot\sin(\varphi_1-\varphi_2)]$$

$$z = [r,\varphi] \Rightarrow z^n = [r^n, n\cdot\varphi] = r^n\cdot[\cos(n\cdot\varphi) + i\cdot\sin(n\cdot\varphi)]$$

| | | |
|---|---|---|
| $A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix} = [a_{ij}]_{m\times n}$ | $A^T = [a_{ji}]_{n\times m}$ | $k\cdot A = [k\cdot a_{ij}]_{m\times n}$ |
| $A = [a_{ij}]_{m\times n}\ B = [b_{ij}]_{m\times n} \Rightarrow A + B = [a_{ij} + b_{ij}]_{m\times n}$ | | $A = [a_{ij}]_{m\times n}\ B = [b_{ij}]_{n\times p} \Rightarrow A\cdot B = \left[\sum_{l=1}^{n} a_{il}\cdot b_{lj}\right]_{m\times p}$ |

Wyznacznik

$$W = \det(A) = \begin{vmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{vmatrix}$$

Dopełnienie

$$A_{jk} = (-1)^{j+k}\cdot M_{jk} = (-1)^{j+k}\cdot \begin{vmatrix} a_{11} & a_{12} & \cdots & a_{1k} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2k} & \cdots & a_{2n} \\ \vdots & \vdots & \cdots & \vdots & \cdots & \vdots \\ a_{j1} & a_{j2} & \cdots & a_{jk} & \cdots & a_{jn} \\ \vdots & \vdots & \cdots & \vdots & \cdots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nk} & \cdots & a_{nn} \end{vmatrix}$$

| | |
|---|---|
| $W = \det(A) = \sum_{m=1}^{n} a_{wm}\cdot A_{wm}$ | $W = \det(A) = \sum_{m=1}^{n} a_{mk}\cdot A_{mk}$ |

| | | |
|---|---|---|
| Macierz odwrotna, $A^{-1}$ | $A^{-1}\cdot A = A\cdot A^{-1} = I$ | $A^{-1} = \frac{1}{\det(A)}\cdot[A_{jk}]^T$ |
| Równanie macierzowe | $A\cdot X = B$ | $X = A^{-1}\cdot B$ |