Machten

Voor alle $a,b > 0$

$a^{-p} = \frac{1}{aP}$

$a^{\frac{p}{q}} = \sqrt[q]{a^p}$

$a^p \cdot a^q = a^{p+q}$

$\frac{a^p}{a^q} = a^{p-q}$

$(a \cdot b)^p = a^p \cdot b^p$

$(a^p)^q = a^{pq}$

Logaritmen

Voor alle $g > 0$ en $g \neq 1$ en alle $a,b > 0$

${}^g\log ab = {}^g\log a + {}^g\log b$

${}^g\log \frac{a}{b} = {}^g\log a - {}^g\log b$

${}^g\log a^q = q \cdot {}^g\log a \quad (q \in \mathbb{R})$

${}^g\log a = \frac{{}^p\log a}{{}^p\log g} \quad (p > 0 \; en \; p \neq 1)$

$g^x = a \Leftrightarrow x = {}^g\log(a)$

abc-formule

$D = b^2 - 4ac$

$x_{1,2} = \frac{-b \pm \sqrt{D}}{2a}$

Goniometrische formules

$\sin^2(x) + \cos^2(x) = 1$

$\tan(x) = \frac{\sin(x)}{\cos(x)}$

$\sin(x) = \cos(\frac{1}{2}\pi - x)$

$\cos(x) = \sin(\frac{1}{2}\pi - x)$

$\sin(x \pm y) = \sin(x)\cdot\cos(y) \pm \cos(x)\cdot\sin(y)$

$\cos(x \pm y) = \cos(x)\cdot\cos(y) \pm \sin(x)\cdot\sin(y)$

$\tan(x \pm y) = \frac{\tan(x) \pm \tan(y)}{1 \mp \tan(x)\cdot\tan(y)}$

$\sin(2x) = 2\sin(x)\cdot\cos(x)$

$\cos(2x) = (\cos x)^2 - (\sin x)^2 = 2(\cos x)^2 - 1$
$= 1 - 2(\sin x)^2$

$(\cos x)^2 = \frac{1}{2}(1 + \cos(2x))$

$(\sin x)^2 = \frac{1}{2}(1 - \cos(2x))$

$\sin x + \sin y = 2\sin(\frac{1}{2}(x+y))\cdot xos(\frac{1}{2}(x-y))$

$\sin x - \sin y = 2\sin(\frac{1}{2}(x-y))\cdot\cos(\frac{1}{2}(x+y))$

$\cos x + \cos y = 2\cos(\frac{1}{2}(x+y))\cdot\cos(\frac{1}{2}(x-y))$

$\cos x - \cos y = -2\sin(\frac{1}{2}(x+y))\cdot\sin(\frac{1}{2}(x-y))$

$\sin x \cdot \cos y = \frac{1}{2}(\sin(x+y) + \sin(x-y))$

$\sin x \cdot \sin y = \frac{1}{2}(\cos(x-y) - \cos(x+y))$

$\cos x \cdot \cos y = \frac{1}{2}(\cos(x+y) + \cos(x-y))$

$\sin(x) = \sin(\alpha) \Leftrightarrow x = \alpha + k\cdot 2\pi \vee x = \pi - \alpha + k\cdot 2\pi$

$\cos(x) = \cos(\alpha) \Leftrightarrow x = \alpha + k\cdot 2\pi \vee x = -\alpha + k\cdot 2\pi$

$\tan(x) = \tan(\alpha) \Leftrightarrow x = \alpha + k\cdot\pi$

Differentiaalrekening

Rekenregels

$(c\cdot f(x))' = c\cdot f'(x)$

$(\alpha f(x) + \beta g(x))' = \alpha f'(x) + \beta g'(x) \; (somregel)$

$(f(x)\cdot g(x))' = f'(x)\cdot g(x) + f(x)\cdot g'(x)$

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

$f(g(x))' = f'(g(x))\cdot g'(x)$

Standaard afgeleiden

$f(x) = \sin(x) \Leftrightarrow f'(x) = \cos(x)$

$f(x) = \cos(x) \Leftrightarrow f'(x) = -\sin(x)$

$f(x) = \tan(x) \Leftrightarrow f'(x) = \frac{1}{\cos^2(x)}$

$f(x) = e^x \Leftrightarrow f'(x) = e^x$

$f(x) = a^x \Leftrightarrow f'(x) = a^x \ln(a)$

$f(x) = \ln(x) \Leftrightarrow f'(x) = \frac{1}{x}$

$f(x) = {}^a\log(x) \Leftrightarrow f'(x) = \frac{1}{x\ln(a)}$

$f(x) = \sin^{-1}(x) \Leftrightarrow f'(x) = \frac{1}{\sqrt{1-x^2}}$

$f(x) = \cos^{-1}(x) \Leftrightarrow f'(x) = \frac{-1}{\sqrt{1-x^2}}$

$f(x) = \tan^{-1}(x) \Leftrightarrow f'(x) = \frac{1}{1+x^2}$

Integraalrekening

Rekenregels

$\int f'g\,dx = fg - \int fg'\,dx$ of

$\int_b fg'\,dx = fg - \int f'g\,dx$ (Partiele)

$\int_a^b (\alpha f(x) + \beta g(x))dx = \alpha\int_a^b f(x)dx + \beta\int_a^b g(x)dx$

Standaard integralen

$\int ax^n\,dx = \frac{a}{n+1}x^{n+1} + C$

$\int \frac{1}{x}\,dx = \ln|x| + C$

$\int \sin(x)\,dx = -\cos(x) + C$

$\int \cos(x)\,dx = \sin(x) + C$

$\int \tan(x)\,dx = -\ln|\cos(x)| + C$

$\int \frac{1}{\cos^2(x)}\,dx = \tan(x) + C$

$\int a^x\,dx = \frac{a^x}{\ln(a)} + C$

$\int e^x\,dx = e^x + C$

$\int \frac{1}{\sqrt{a^2 - x^2}}\,dx = \sin^{-1}(\frac{x}{a}) + C$

$\int \frac{1}{a^2 + x^2}\,dx = \frac{1}{a}\tan^{-1}(\frac{x}{a}) + C$

Vectoren

$\begin{pmatrix}a_1\\a_2\end{pmatrix} + \begin{pmatrix}b_1\\b_2\end{pmatrix} = \begin{pmatrix}a_1+b_1\\a_2+b_2\end{pmatrix}$

$\lambda\cdot\begin{pmatrix}a_1\\a_2\end{pmatrix} = \begin{pmatrix}\lambda a_1\\\lambda a_2\end{pmatrix}$

$\begin{vmatrix}a_1\\a_2\\a_n\end{vmatrix}(|\vec{a}|) = \sqrt{\sum_{i=1}^{n} a_i^2}$ lengte vector

Inwendig product:

$\vec{a}\cdot\vec{b} = \sum_{i=1}^{n} a_i\cdot b_i$

$\vec{a}\cdot\vec{b} = |a|\cdot|b|\cdot\cos(\phi)$

$\vec{a}\cdot\vec{b} = \vec{b}\cdot\vec{a}$

$\vec{a}\cdot(\vec{b}+\vec{c}) = \vec{a}\cdot\vec{b} + \vec{a}\cdot\vec{c}$

$(\lambda\vec{a})\cdot\vec{b} = \vec{a}\cdot(\lambda\vec{b}) = \lambda(\vec{a}\cdot\vec{b})$

$\vec{a}\cdot\vec{b} = 0 \Rightarrow \vec{a} \perp \vec{b}$

$|p| = |a|\cdot\frac{\vec{a}\cdot\vec{b}}{|a|\cdot|b|} = \frac{\vec{a}\cdot\vec{b}}{|b|}$ projectie lengte

$\vec{p} = \frac{\vec{a}\cdot\vec{b}}{|b^2|}\cdot\vec{b}$ projectie vector

$\cos(\phi) = \frac{\vec{a}\cdot\vec{b}}{|\vec{a}|\cdot|\vec{b}|}$ hoek tussen 2 vectoren

Uitwendig product:

$\vec{c} \perp \vec{a} \wedge \vec{c} \perp \vec{b}$

$|a \times b| = |a|\cdot|b|\cdot\sin(\phi)$

$\vec{a}\times\vec{b} = -(\vec{b}\times\vec{a})$

$\vec{a}\times(\vec{b}+\vec{c}) = \vec{a}\times\vec{b} + \vec{a}\times\vec{c}$

$(\lambda\vec{a})\times\vec{b} = \vec{a}\times(\lambda\vec{b}) = \lambda(\vec{a}\times\vec{b})$

$\vec{a}\times\vec{b} = \begin{matrix}a_2 b_3 - a_3 b_2\\(a_3 b_1 - a_1 b_3)\\a_1 b_2 - a_2 b_1\end{matrix}$ shoelace method

Matrices

$det(\begin{bmatrix}a & b\\c & d\end{bmatrix}) = ad - bc$ determinant

Transposon, diagonaal spiegelen

$\begin{bmatrix}a & b\\c & d\end{bmatrix}^T = \begin{bmatrix}a & c\\b & d\end{bmatrix}$

Inverse matrix

$\left[\begin{array}{cc|cc}a & b & 1 & 0\\c & d & 0 & 1\end{array}\right]$ Modificaties tot abcd = 1001

Mogelijke modificaties:
- 2 rows/columns wisselen
- row/column +- andere row/column
- row/column vermenigvuldigen/delen

Limieten

Standaard limieten

$\lim_{x\Rightarrow\infty} g^x = 0 \; (0 < g < 1)$

$\lim_{x\Rightarrow\infty} g^x = \infty \; (g > 1)$

$\lim_{x\Rightarrow 0} \frac{\sin(x)}{x} = 1$

$\lim_{x\Rightarrow 0} \frac{\tan(x)}{x} = 1$

$\lim_{x\Rightarrow\infty} \frac{\sin(x)}{x} = 0$

Overige regels

$\lim_{x\Rightarrow a}$ Perforatie op x=a, (x-a) eruit halen

$\lim_{x\Rightarrow\infty} \frac{a^m}{c^n} = 0 \; (m < n)$

$\frac{1}{x}$ loopt linksonder, rechtsboven

$-\frac{1}{x}$ loopt linksboven, rechtsonder

$\lim_{x\Rightarrow\infty}$ + hoogste termen wegstrepen geeft horizontale asymptoot