Calculus

H0 Parate kennis

Goniometrische functies

$A^2 - B^2 = (A+B)(A-B)$

Exponentiële regels

$a^0 = 1$
$a^{x+y} = a^x \cdot a^y$
$a^{x-y} = \frac{a^x}{a^y}$
$(a^x)^y = a^{xy}$
$a^{-x} = \frac{1}{a^x}$
$a^{\frac{m}{n}} = \sqrt[n]{a^m}$

Logaritmische regels

$y = \log_a(x) \Leftrightarrow x = a^y$
$\log_a(x) + \log_a(y) = \log_a(x \cdot y)$
$\log_a(x) - \log_a(y) = \log_a\left(\frac{x}{y}\right)$
$\log_a(x^y) = y \cdot \log_a(x)$
$\log_a(x) = \frac{\log_b(x)}{\log_b(a)}$

H1 Getallenverzameling

Complexe getallen

$i^2 = -1$

Poolcoördinaten

$r = \sqrt{(x^2+y^2)}$
$\theta = \arctan\left(\frac{y}{x}\right)$
$z = r \operatorname{cis}\alpha = r(\cos\alpha + i\sin\alpha)$
$(r \operatorname{cis}\alpha)^n = r^n \operatorname{cis}(n\alpha)$
$z_k = \sqrt[n]{r} \operatorname{cis}\left(\frac{\alpha+2k\pi}{n}\right)$

H2 Limieten

Exponentiële en logaritmische functies

$\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x = e$
$\lim_{x\to\infty}\left(1+\frac{k}{x}\right)^x = e^k$

Bijzondere goniometrische limieten

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

H3 Afgeleiden

Basics

$D(x^n) = nx^{n-1}dx$
$D(f(x)+g(x)) = D(f(x)) + D(g(x))$
$D(\lambda f(x)) = \lambda D(f(x))$
$d(f \cdot g)(x) = f(x)g'(x) + f'(x)g(x)$
$d\left(\frac{f(x)}{g(x)}\right) = \frac{g(x)f'(x) - g'(x)f(x)}{(g(x))^2}$

Goniometrische functies

$D(\sin x) = \cos x$
$D(\cos x) = -\sin x$
$D(\tan x) = \frac{1}{\cos^2 x}$
$D(\cot x) = \frac{-1}{\sin^2 x}$
$D(\sec x) = \frac{\sin x}{\cos^2 x}$
$D(\csc x) = \frac{-\cos x}{\sin^2 x}$

Cyclometrische functies

$D(\operatorname{Bgsin} x) = \frac{1}{\sqrt{1-x^2}}$
$D(\operatorname{Bgcos} x) = \frac{-1}{\sqrt{1-x^2}}$
$D(\operatorname{Bgtan} x) = \frac{1}{1+x^2}$
$D(\operatorname{Bgcot} x) = \frac{-1}{1+x^2}$

Hyperbolische functies

$D(\sinh x) = \cosh x$
$D(\cosh x) = \sinh x$
$D(\tanh x) = \frac{1}{\cosh^2 x}$
$D(\coth x) = \frac{-1}{\sinh^2 x}$

Exponentiële functies

$D(a^x) = a^x \ln a$
$D(e^x) = e^x$
$D(\ln x) = \frac{1}{x}$
$D(\log_a x) = \frac{1}{x \ln a}$

Kettingregel

$D(f(g(x))) = f'(g(x))g'(x)$

Machtsregel

$D(f(x)^{g(x)}) = g(x)f(x)^{g(x)-1}f'(x) + f(x)^{g(x)}g'(x)\ln f(x)$

H4 Integralen

Basics

$\int x^n dx = \frac{x^{n+1}}{n+1} + C$
$\int f(x) + g(x)dx = \int f(x)dx + \int g(x)dx$
$\int \lambda f(x)dx = \lambda \int f(x)dx$
$\int f(x)g'(x)dx = f(x)g(x) - \int f'(x)g(x)dx$
$\int \frac{f'(x)}{f(x)}dx = \ln|f(x)| + C$

Goniometrische functies

$\int \sin x dx = -\cos x + C$
$\int \cos x dx = \sin x + C$
$\int \frac{1}{\cos^2 x}dx = \tan x + C$
$\int \frac{-1}{\sin^2 x}dx = \cot x + C$

Cyclometrische functies

$\int \frac{1}{\sqrt{1-x^2}}dx = \operatorname{Bgsin} x + C$
$\int \frac{1}{\sqrt{a^2-x^2}}dx = \operatorname{Bgsin}\frac{x}{a} + C$
$\int \frac{1}{x^2+1}dx = \operatorname{Bgtan} x + C$
$\int \frac{1}{\sqrt{x^2+a}}dx = \ln|x + \sqrt{x^2+a}| + C$

Hyperbolische functies

$\int \cosh x dx = \sinh x + C$
$\int \sinh x dx = \cosh x + C$
$\int \frac{1}{\cosh^2 x}dx = \tanh x + C$
$\int \frac{1}{\sinh^2 x}dx = -\coth x + C$

Exponentiële functies

$\int a^x dx = \frac{a^x}{\ln a} + C$
$\int e^x dx = e^x + C$
$\int \frac{1}{x}dx = \ln|x| + C$

H5 Bepaalde integralen

Oppervlakte

Cartesisch	$S = \int_a^b \|f(x)\| dx$
Parameter	$S = \int_a^b \|g(t)\| f'(t) dt$
Pool	$S = \int_\alpha^\beta (r(\theta))^2 d\theta$

Omwentelingsvolume

Cartesisch	$V = \pi \int_a^b (f(x))^2 dx$
Parameter	$V = \pi \int_a^b (g(t))^2 f'(t) dt$
Pool	

Booglengte

Cartesisch	$L = \int_a^b \sqrt{1 + (f'(x))^2} dx$
Parameter	$L = \int_a^b \sqrt{(f'(t))^2 + (g'(t))^2} dt$
Pool	$L = \int_\alpha^\beta \sqrt{(r(\theta))^2 + (r'(\theta))^2} d\theta$

Complanatie

Cartesisch	$C = 2\pi \int_a^b \|f(x)\| \sqrt{1 + (f'(x))^2} dx$
Parameter	$C = 2\pi \int_a^b \|g(t)\| \sqrt{(f'(t))^2 + (g'(t))^2} dt$
Pool	