

Calculus

H1 Getallenverzameling

Poolcoördinaten

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

H2 Limieten

Exponentiële en logaritmische functies

$$\begin{aligned}\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x &= e \\ \lim_{x \rightarrow \infty} \left(1 + \frac{k}{x}\right)^x &= e^k\end{aligned}$$

Bijzondere goniometrische limieten

$$\begin{aligned}\lim_{x \rightarrow 0} \frac{\sin(x)}{x} &= 1 \\ \lim_{x \rightarrow 0} \frac{\tan(x)}{x} &= 1\end{aligned}$$

H3 Afgeleiden

Basics

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

Goniometrische functies

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

Cyclometrische functies

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

Hyperbolische functies

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

Exponentiële functies

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

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

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

Goniometrische functies

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

Cyclometrische functies

$$\begin{aligned}\int \frac{1}{\sqrt{1-x^2}} dx &= \operatorname{Bgsin} x + C \\ \int \frac{1}{\sqrt{a^2-x^2}} dx &= \operatorname{Bgsin} \frac{x}{a} + C \\ \int \frac{1}{x^2+1} dx &= \operatorname{Bgtan} x + C\end{aligned}$$

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

Hyperbolische functies

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

Exponentiële functies

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

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	