

# Calculus

## H1 Getallenverzameling

$$r = \sqrt{(x^2 + y^2)}$$

$$\theta = \arctan\left(\frac{y}{x}\right)$$

$$r \operatorname{cis} \alpha = r \cos + i r \sin$$

$$\sqrt[n]{z} = \sqrt[n]{r} \operatorname{cis} \left( \frac{\alpha + 2k\pi}{n} \right)$$

## H2 Limieten

### Exponentiële en logaritmische functies

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

### Bijzondere goniometrische limieten

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

## 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	