

# Alpha Wiskunde Formuleblad

## Alpha Mathematics Formula Sheet

### ALGEBRA

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	$ x  = \begin{cases} x & \text{as / if } x \geq 0 \\ -x & \text{as / if } x < 0 \end{cases}$	Cramer se reël / Cramer's rule $x_i = \frac{ A_i }{ A }$	
$\sum_{i=1}^n 1 = n$	$\sum_{i=1}^n i = \frac{n^2}{2} + \frac{n}{2}$	$\sum_{i=1}^n i^2 = \frac{n^3}{3} + \frac{n^2}{2} + \frac{n}{6}$	
$z = x + yi$	$z^* = x - yi$	$z = r \operatorname{cis} \theta$	$z = r e^{i\theta}$
$x = r \cos \theta$ en / and $y = r \sin \theta$		$[r(\cos \theta + i \sin \theta)]^n = r^n [\cos(n\theta) + i \sin(n\theta)]$	
$r^2 = x^2 + y^2$ en / and $\tan \theta = \frac{y}{x}$			

$\log A + \log B = \log(AB)$	$\log A - \log B = \log\left(\frac{A}{B}\right)$	$\log A^n = n \log A$
$(a + b)^n = \sum_{r=0}^n \binom{n}{r} a^{n-r} b^r$		
$(1 + x)^n = 1 + \frac{nx}{1!} + \frac{n(n-1)x^2}{2!} + \dots$ ; mits / if $ x  < 1$		

### VEKTORE

$ AB  = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$	$\mathbf{u} \times \mathbf{v} = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ u_1 & u_2 & u_3 \\ v_1 & v_2 & v_3 \end{vmatrix}$		
$ OP  = \sqrt{a^2 + b^2 + c^2}$	$\mathbf{u} \cdot \mathbf{v} =  \mathbf{u}  \mathbf{v}  \cos \theta$	$\mathbf{u} \cdot \mathbf{v} = x_1 \cdot x_2 + y_1 \cdot y_2 + z_1 \cdot z_2$	$\alpha = \frac{\text{bgcos}\left(\frac{u_n}{ \mathbf{u} }\right)}{\arccos\left(\frac{u_n}{ \mathbf{u} }\right)}$

### CALCULUS

$a_{n+1} = a_n - \frac{f(a_n)}{f'(a_n)}$	$\int f'(g(x)) \cdot g'(x) dx = f(g(x)) + k$
$V = \pi \int_a^b [f(x)]^2 dx$	$\int f(x) \cdot g'(x) dx = f(x) \cdot g(x) - \int f'(x) \cdot g(x) dx + k$
Riemansom / Riemann sum = $\lim_{n \rightarrow \infty} \sum_{i=1}^n f(x_i) \cdot \Delta x_i$	

### TRIGONOMETRIE / TRIGONOMETRY

<b>In 'n sektor / In a sector:</b> $s = r\theta$ en / and $A = \frac{1}{2}r^2\theta$		
<b>Identiteite / Identities:</b>		
$\sin^2 x + \cos^2 x = 1$	$\tan^2 x + 1 = \sec^2 x$	$\cot^2 x + 1 = \operatorname{cosec}^2 x$
$\operatorname{cosec} x = \frac{1}{\sin x}$	$\sec x = \frac{1}{\cos x}$	$\cot x = \frac{1}{\tan x}$
$\cos^2 x = \frac{1}{2}[1 + \cos(2x)]$	$\sin^2 x = \frac{1}{2}[1 - \cos(2x)]$	
$\sin A \cdot \sin B = \frac{1}{2}[\cos(A - B) - \cos(A + B)]$ $\sin A \cdot \cos B = \frac{1}{2}[\sin(A + B) + \sin(A - B)]$ $\cos A \cdot \cos B = \frac{1}{2}[\cos(A - B) + \cos(A + B)]$		

### TABEL MET AFGELEIDES / TABLE WITH DERIVATIVES

$F(x)$	$F'(x)$
$ax^n$	$nax^{n-1}$
$\sin x$	$\cos x$
$\cos x$	$-\sin x$
$\tan x$	$\sec^2 x$
$\cot x$	$-\operatorname{cosec}^2 x$
$\sec x$	$\sec x \cdot \tan x$
$\operatorname{cosec} x$	$-\operatorname{cosec} x \cdot \cot x$
bgsin x arcsin x	$\frac{1}{\sqrt{1-x^2}}$
bgbcos x arccos x	$\frac{-1}{\sqrt{1-x^2}}$
bgtan x arctan x	$\frac{1}{x^2+1}$
$a^x$	$a^x \cdot \ln a$
$\log_a x$	$\frac{1}{x \cdot \ln a}$
$e^x$	$e^x$
$\ln x $	$\frac{1}{x}$

### Reëls van differensiasie / Rules for differentiation

$f(x) \cdot g(x)$	$f'(x) \cdot g(x) + f(x) \cdot g'(x)$
$\frac{f(x)}{g(x)}$	$\frac{f'(x) \cdot g(x) - f(x) \cdot g'(x)}{[g(x)]^2}$
$f[g(x)]$	$f'[g(x)] \cdot g'(x)$

## SKOOL FORMULES / SCHOOL FORMULAE

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

$$T_n = a + (n - 1)d$$

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}; r \neq 1$$

$$S_\infty = \frac{a}{1 - r}; -1 < r < 1$$

$$F = \frac{x[(1 + i)^n - 1]}{i}$$

$$P = \frac{x[1 - (1 + i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

$$(x - a)^2 + (y - b)^2 = r^2$$

In  $\Delta ABC$ :  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\text{Area } \Delta ABC = \frac{1}{2}ab \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$$

$$\cos 2\alpha = \begin{cases} \cos^2 \alpha - \sin^2 \alpha \\ 1 - 2 \sin^2 \alpha \\ 2 \cos^2 \alpha - 1 \end{cases}$$

$$\sin 2\alpha = 2 \sin \alpha \cos \alpha$$

$$\bar{x} = \frac{\sum x}{n}$$

$$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A \text{ of } B) = P(A) + P(B) - P(A \text{ en } B)$$

$$\hat{y} = a + bx$$

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$