Berufskolleg der Stadt Bochum
Technische Berufliche Schule 1

Formelsammlung

Binomische Formeln

$(a + b)^2 = a^2 + 2ab + b^2$ $\qquad (a - b)^2 = a^2 - 2ab + b^2$ $\qquad (a + b)(a - b) = a^2 - b^2$

$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

Potenzen

$a^0 = 1$ $\qquad a^{-k} = \frac{1}{a^k}$ $\qquad \sqrt[p]{a^k} = a^{\frac{k}{p}}$ $\qquad a^k \cdot a^p = a^{k+p}$

$(a^k)^p = a^{k \cdot p}$ $\qquad \frac{a^k}{a^p} = a^{k-p}$ $\qquad a^k \cdot b^k = (a \cdot b)^k$ $\qquad \frac{a^k}{b^k} = \left(\frac{a}{b}\right)^k$

Logarithmen

$a^k = b \Leftrightarrow k = \log_a(b) = \frac{\lg(b)}{\lg(a)} = \frac{\ln(b)}{\ln(a)}$ $\qquad \lg(b) = \log_{10}(b)$ $\qquad \ln(b) = \log_e(b)$

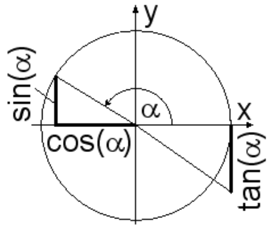
$\lg(b \cdot c) = \lg(b) + \lg(c)$ $\qquad \lg\left(\frac{b}{c}\right) = \lg(b) - \lg(c)$ $\qquad \lg(b)^k = k \cdot \lg(b)$

Satz von VIETA (pq-Formel)

$x^2 + px + q = 0 \Leftrightarrow x_{1,2} = -\frac{p}{2} \pm \sqrt{\left(\frac{p}{2}\right)^2 - q}$ mit $x_1 + x_2 = -p$ und $x_1 \cdot x_2 = q$

Winkelfunktionen Trigonometrie

$\sin(\alpha) = \frac{\text{Gegenkathete}}{\text{Hypothenuse}}$ $\qquad \cos(\alpha) = \frac{\text{Ankathete}}{\text{Hypothenuse}}$



$\tan(\alpha) = \frac{\text{Gegenkathete}}{\text{Ankathete}} = \frac{\sin(\alpha)}{\cos(\alpha)}$

$\sin(\alpha) = k \Rightarrow \alpha = \text{arc}\sin(k)$; *[TR: $\sin^{-1}(k)$]*

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

Bogenmaß $\quad 1\text{rad} = \frac{360°}{2\pi}$ $\qquad$ Gradmaß $\quad 1° = \frac{2\pi \text{ rad}}{360°}$

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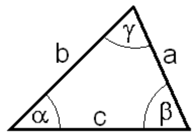
Sinussatz: $\frac{a}{\sin(\alpha)} = \frac{b}{\sin(\beta)} = \frac{c}{\sin(\gamma)}$

Kosinussatz: $a^2 = b^2 + c^2 - 2bc\cos(\alpha);$

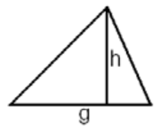
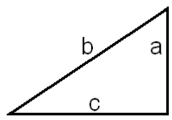
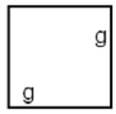
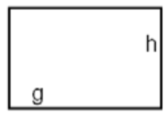
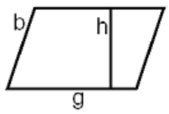
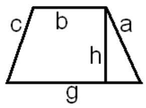
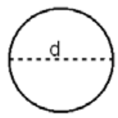
$b^2 = a^2 + c^2 - 2ac\cos(\beta);$

$c^2 = a^2 + b^2 - 2ab\cos(\gamma)$



Geometrie in der Ebene

A: Fläche U: Umfang g: Grundseite h: Höhe d: Durchmesser r: Radius

Dreieck (beliebig)	$A = \frac{g \cdot h}{2}$ $U = a + b + c$	
Dreieck (rechtwinklig)	$b^2 = a^2 + c^2$	
Quadrat	$A = g^2$ $U = 4\,g$	
Rechteck	$A = g \cdot h$ $U = 2g + 2h$	
Parallelogramm	$A = g \cdot h$ $U = 2g + 2b$	
Trapez	$A = \frac{g + b}{2} \cdot h$ $U = g + a + b + c$	
Kreis	$A = \pi \cdot r^2 = \pi \frac{d^2}{4}$ $U = 2\pi\, r = \pi\, d$ $d = 2r$	

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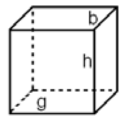
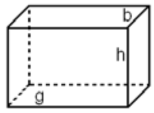
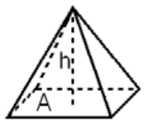
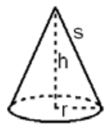
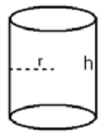
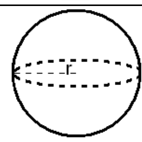
TBS1

Formelsammlung

Geometrie im Raum

V: Volumen O: Oberfläche A: Grundfläche M: Mantelfläche

Würfel	$V = g^3$ $O = 6g^2$ $g = b = h$	
Quader	$V = g \cdot h \cdot b$ $O = 2(gh + hb + gb)$	
Pyramide	$V = \frac{A \cdot h}{3}$ $O = A + M$	
Kegel	$V = \frac{A \cdot h}{3} = \frac{\pi r^2 h}{3}$ $O = A + M = \pi r^2 + \pi r s$ $M = \pi rs$	
Zylinder	$V = \pi r^2 h$ $O = \pi r^2 + 2 \pi r h$ $M = 2 \pi r h$	
Kugel	$V = \frac{4}{3} \pi r^3$ $O = 4 \pi r^2$ $r = \frac{d}{2}$	

Analysis

Kriterien für:

Extrempunkte: $f'(x_E) = 0$ und $f''(x_E) > 0 \Rightarrow P(x_E / f(x_E))$ ist Minimum
$f'(x_E) = 0$ und $f''(x_E) < 0 \Rightarrow P(x_E / f(x_E))$ ist Maximum

Wendepunkte: $f''(x_W) = 0$ und $f'''(x_W) \neq 0 \Rightarrow P(x_W / f(x_W))$ ist Wendepunkt

Sattelpunkte: $f'(x_W) = 0$ und $f''(x_W) = 0$ und $f'''(x_W) \neq 0$
$\Rightarrow P(x_W / f(x_W))$ ist Sattelpunkt

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Formelsammlung

F(x)	f(x)	f ' (x)
a x	a	0
$\frac{x^{k+1}}{k+1}$, $k \neq -1$	x^k	$k \cdot x^{k-1}$
– cos(x)	sin(x)	cos(x)

F(x)	f(x)	f ' (x)
sin(x)	cos(x)	– cos(x)
e^x	e^x	e^x
$x \cdot \ln(x) - x$	ln(x)	x^{-1}

Produktregel: $(f' \cdot g') = f' \cdot g + f \cdot g'$

Quotientenregel: $\left(\frac{f}{g}\right)' = \frac{f' \cdot g - f \cdot g'}{g^2}$

Kettenregel: „***äußere***“ Ableitung mal „***innere***“ Ableitung

Unbestimmtes Integral: $F(x) = \int f(x)\,dx + C$

Bestimmtes Integral: $\int_a^b f(x)\,dx = F(b) - F(a)$

Vektorrechnung

Vektor $\vec{AB} = \vec{OB} - \vec{OA} = \vec{r}_B - \vec{r}_A$

Abstand der Punkte A und B: $|\vec{AB}| = |\vec{a}| = \sqrt{(b_x - a_x)^2 + (b_y - a_y)^2 + (b_z - a_z)^2}$

Mittelpunkt M der Strecke AB $\vec{OM} = \frac{1}{2}\left(\vec{OA} + \vec{OB}\right)$

Skalares Produkt $\vec{a} \bullet \vec{b} = |\vec{a}| \cdot |\vec{b}| \cos(\vec{a}, \vec{b}) = a_x b_x + a_y b_y + a_z b_z = \lambda$, $\lambda \in \mathbb{R}$

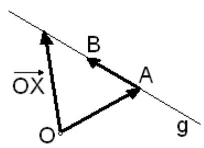
Orthogonalität $\vec{a} \perp \vec{b} \Leftrightarrow \vec{a} \bullet \vec{b} = 0$

Parallelität $\vec{a} \parallel \vec{b} \Rightarrow \vec{a} \times \vec{b} = \vec{0}$

Vektorprodukt $\vec{a} \times \vec{b} = \vec{c} = \begin{pmatrix} a_y b_z - a_z b_y \\ a_z b_x - a_x b_z \\ a_x b_y - a_y b_z \end{pmatrix}$; $A = |\vec{a} \times \vec{b}| = |\vec{a}| \cdot |\vec{b}| \sin(\vec{a}, \vec{b})$

Parameterdarstellung einer Geraden

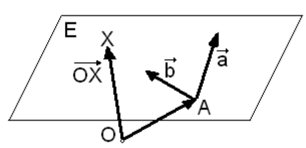
g: $\vec{OX} = \vec{OA} + \lambda \cdot \vec{AB}$, $\lambda \in \mathbb{R}$ oder g: $\vec{OX} = \vec{OA} + r \cdot \vec{a}$, $r \in \mathbb{R}$



Parameterdarstellung einer Ebene

E: $\vec{OX} = \vec{OA} + \lambda \cdot \vec{a} + \nu \cdot \vec{b}$, $\lambda, \nu \in \mathbb{R}$ oder

E: $\vec{OX} = \vec{OA} + r \cdot \vec{a} + s \cdot \vec{b}$, $r,s \in \mathbb{R}$



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