

Technische Mechanik 1

Formelsammlung



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DARMSTADT

Fachbereich Maschinenbau, Fachgebiet für Strömungsdynamik (FDY)
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6. Februar 2018

1 Trigonometrie



Winkelbeziehungen:

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

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

$$\sin(\alpha) = \sin(\alpha + 2\pi)$$

$$\cos(\alpha) = \cos(\alpha + 2\pi)$$

$$\sin(\alpha) = \cos\left(\frac{\pi}{2} - \alpha\right)$$

$$\cos(\alpha) = \sin\left(\frac{\pi}{2} + \alpha\right)$$

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

rad	0	$\frac{1}{2}\pi$	$\frac{1}{4}\pi$	$\frac{3}{4}\pi$	$\frac{1}{2}\pi$	π	2π
deg	0°	30°	45°	60°	90°	180°	360°
sin	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1	0	0
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	-1	1
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	$\pm\infty$	0	0

2 Schwerpunkte

Formeln sind für Koordinatenrichtung x gegeben, y und z analog.

Volumen	Fläche	Linie
$x_s = \frac{\sum x_i V_i}{\sum V_i}$ $= \frac{1}{V} \int x dV$	$x_s = \frac{\sum x_i A_i}{\sum A_i}$ $= \frac{1}{A} \int x dA$	$x_s = \frac{\sum x_i l_i}{\sum l_i}$ $= \frac{1}{l} \int x dl$

Massenmittelpunkt:

$$x_s = \frac{\sum x_i m_i}{\sum m_i}$$

$$= \frac{\int x \rho dV}{\int \rho dV}$$

Flächen und Volumina:

Kreis: $A = \pi r^2, U = 2\pi r$

Kugel: $V = \frac{4}{3}\pi r^3$

Zylinder:

$$V = \pi r^2 h$$

Kegel:

$$V = \frac{1}{3}\pi r^2 h$$

Fläche

Schwerpunktskoordinaten



$$A = \frac{1}{2}ah$$

$$x_s = \frac{1}{3}a$$

$$y_s = \frac{1}{3}h$$



$$A = \frac{1}{2}[(x_2 - x_1)(y_3 - y_1) - (x_3 - x_1)(y_2 - y_1)]$$

$$x_s = \frac{1}{3}(x_1 + x_2 + x_3)$$

$$y_s = \frac{1}{3}(y_1 + y_2 + y_3)$$



$$A = ah$$

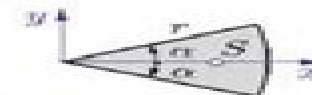
S liegt im Schnittpunkt der Diagonalen



$$A = \frac{1}{2}(a + b)h$$

S liegt auf der Seitenhalbierenden

$$x_s = \frac{1}{3} \frac{a^2 + ab + b^2}{a + b}$$



$$A = \alpha r^2$$

$$x_s = \frac{2}{3} r \frac{\sin \alpha}{\alpha}$$



$$A = \frac{1}{2} r^2$$

$$x_s = \frac{2}{3} r$$



$$A = \frac{1}{2} r^2 (2\alpha - \sin 2\alpha)$$

$$x_s = \frac{2}{3\alpha} r \frac{\sin^3 \alpha}{\alpha}$$



quadratische Parabel

$$A = \frac{2}{3}ab$$

$$x_s = \frac{1}{3}a$$

$$y_s = \frac{1}{3}b$$

Technische Mechanik

Jiyuan Zhang



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