NACIONALNI CENTAR ZA VANJSKO VREDNOVANJE OBRAZOVANJA

Identifikacijska naljepnica

PAŽLJIVO NALIJEPITI

MATEMATIKA

viša razina

KNJIŽICA FORMULA

MAT T A

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12

Matematika

Knjižica formula

FORMULE

- Kompleksan broj: $i^2=-1,\ \ z=a+bi,\ \ \overline{z}=a-bi,\ \ |z|=\sqrt{a^2+b^2},\ \ a,b\in\mathbf{R}$
- $z=r(\cos\varphi+i\sin\varphi)$, $z_1\cdot z_2=r_1r_2\left(\cos(\varphi_1+\varphi_2)+i\sin(\varphi_1+\varphi_2)\right)$,

  $\frac{z_1}{z_2}=\frac{r_1}{r_2}\left(\cos(\varphi_1-\varphi_2)+i\sin(\varphi_1-\varphi_2)\right)$, $z^n=r^n(\cos n\varphi+i\sin n\varphi)$,

  $\sqrt[n]{z}=\sqrt[n]{r}\left(\cos\left(\frac{\varphi+2k\pi}{n}\right)+i\sin\left(\frac{\varphi+2k\pi}{n}\right)\right),\ k=0,1,...,n-1$

- $a^m\cdot a^n=a^{m+n},\quad a^m:a^n=a^{m-n}(a\neq 0),\quad a^{-m}=\frac{1}{a^m}(a\neq 0),\quad \sqrt[m]{a^n}=a^{\frac{n}{m}}$
- $(a\pm b)^2=a^2\pm 2ab+b^2,$ $\qquad (a\pm b)^3=a^3\pm 3a^2b+3ab^2\pm b^3$
- $a^2-b^2=(a-b)(a+b),$ $\qquad a^3\pm b^3=(a\pm b)(a^2\mp ab+b^2)$
- $(a+b)^n=a^n+\binom{n}{1}a^{n-1}b+...+\binom{n}{k}a^{n-k}b^k+...+\binom{n}{n-1}ab^{n-1}+b^n$

- Kvadratna jednadžba: $ax^2+bx+c=0,\ a\neq 0\Rightarrow x_{1,2}=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$
- Viètеove formule: $x_1+x_2=-\frac{b}{a},\ \ x_1\cdot x_2=\frac{c}{a}$
- Tjeme parabole: $T\left(-\frac{b}{2a},\frac{4ac-b^2}{4a}\right)$

- $b^x=a\Leftrightarrow x=\log_b a,$ $\qquad \log_b b^x=x=b^{\log_b x}$
- $\log_b(xy)=\log_b x+\log_b y,\quad \log_b\frac{x}{y}=\log_b x-\log_b y,\quad \log_b x^y=y\log_b x,\quad \log_a x=\frac{\log_b x}{\log_b a}$

MAT T A

99

Matematika

Knjižica formula

- Površina trokuta: $P = \frac{a \cdot v_a}{2}$, $P = \sqrt{s \cdot (s-a) \cdot (s-b) \cdot (s-c)}$, $s = \frac{a+b+c}{2}$

$$P = \frac{ab \sin \gamma}{2}, \quad P = \frac{abc}{4r_o}, \quad P = r_u s$$

- Jednakostraničan trokut: $P = \frac{a^2\sqrt{3}}{4}$, $v = \frac{a\sqrt{3}}{2}$, $r_o = \frac{2}{3}v$, $r_u = \frac{1}{3}v$

- Površina paralelograma: $P = a \cdot v$
- Površina trapeza: $P = \frac{a+c}{2} \cdot v$
- Površina kruga: $P = r^2\pi$
- Opseg kruga: $O = 2r\pi$
- Površina kružnoga isječka: $P = \frac{r^2\pi\alpha}{360}$
- Duljina kružnoga luka: $l = \frac{r\pi\alpha}{180}$

B = površina osnovke (baze), P = površina pobočja, h = duljina visine

- Obujam (volumen) prizme i valjka: $V = B \cdot h$
- Oplošje prizme i valjka: $O = 2B + P$
- Obujam (volumen) piramide i stošca: $V = \frac{1}{3}B \cdot h$
- Oplošje piramide: $O = B + P$
- Oplošje stošca: $O = r^2\pi + r\pi s$

  r = polumjer osnovke s = duljina izvodnice
- Obujam (volumen) kugle: $V = \frac{4}{3}r^3\pi$
- Oplošje kugle: $O = 4r^2\pi$, r = polumjer kugle

- U pravokutnome trokutu:

$$\text{sinus kuta} = \frac{\text{nasuprotna kateta}}{\text{hipotenuza}}, \quad \text{kosinus kuta} = \frac{\text{priležeća kateta}}{\text{hipotenuza}},$$

$$\text{tangens kuta} = \frac{\text{nasuprotna kateta}}{\text{priležeća kateta}}$$

MAT T A

99

Matematika

Knjižica formula

- Poučak o sinusima: $\frac{a}{\sin\alpha}=\frac{b}{\sin\beta}=\frac{c}{\sin\gamma}$
- Poučak o kosinusima: $c^2=a^2+b^2-2ab\cos\gamma$
- $\sin^2 x+\cos^2 x=1, \qquad \operatorname{tg} x=\frac{\sin x}{\cos x}$
- $\sin 2x=2\sin x\cos x, \qquad \cos 2x=\cos^2 x-\sin^2 x$
- $\sin(x\pm y)=\sin x\cos y\pm\sin y\cos x$

  $\cos(x\pm y)=\cos x\cos y\mp\sin x\sin y$

  $\operatorname{tg}(x\pm y)=\frac{\operatorname{tg} x\pm\operatorname{tg} y}{1\mp\operatorname{tg} x\cdot\operatorname{tg} y}$
- $\sin x+\sin y=2\sin\frac{x+y}{2}\cos\frac{x-y}{2}, \qquad \sin x-\sin y=2\cos\frac{x+y}{2}\sin\frac{x-y}{2}$

  $\cos x+\cos y=2\cos\frac{x+y}{2}\cos\frac{x-y}{2}, \qquad \cos x-\cos y=-2\sin\frac{x+y}{2}\sin\frac{x-y}{2}$
- $\sin x\sin y=\frac{1}{2}\left[\cos(x-y)-\cos(x+y)\right]$

  $\cos x\cos y=\frac{1}{2}\left[\cos(x-y)+\cos(x+y)\right]$

  $\sin x\cos y=\frac{1}{2}\left[\sin(x-y)+\sin(x+y)\right]$
- $\sin\frac{\pi}{6}=\frac{1}{2}, \qquad \sin\frac{\pi}{4}=\frac{\sqrt{2}}{2}, \qquad \sin\frac{\pi}{3}=\frac{\sqrt{3}}{2}$

Matematika

Knjižica formula

- Udaljenost točaka T_1, T_2: $d(T_1,T_2)=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$
- Polovište dužine $\overline{T_1T_2}$: $P\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)$
- Vektor $\overrightarrow{T_1T_2}$: $\overrightarrow{T_1T_2}=\vec{a}=(x_2-x_1)\vec{i}+(y_2-y_1)\vec{j}=a_1\vec{i}+a_2\vec{j}$
- Skalarni umnožak vektora: $\vec{a}\cdot\vec{b}=|\vec{a}|\cdot|\vec{b}|\cdot\cos\alpha$, $\vec{a}\cdot\vec{b}=a_1b_1+a_2b_2$
- Jednadžba pravca: $y-y_1=k(x-x_1)$, $k=\frac{y_2-y_1}{x_2-x_1}$
- Kut α između dvaju pravaca: $\operatorname{tg}\alpha=\left|\frac{k_2-k_1}{1+k_1k_2}\right|$
- Udaljenost točke $T(x_1,y_1)$ i pravca p... $Ax+By+C=0$: $d(T,p)=\frac{|Ax_1+By_1+C|}{\sqrt{A^2+B^2}}$

Matematika

Knjižica formula

Krivulja drugoga reda	Jednadžba	Tangenta u točki krivulje (x_1, y_1)
Kružnica središte $S(p,q)$	$(x-p)^2+(y-q)^2=r^2$	$(x_1-p)(x-p)+(y_1-q)(y-q)=r^2$
Elipsa fokusi $F_{1,2}(\pm e,0)$ $e^2=a^2-b^2$	$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$	$\frac{x_1x}{a^2}+\frac{y_1y}{b^2}=1$
Hiperbola fokusi $F_{1,2}(\pm e,0)$ $e^2=a^2+b^2$ asimptote $y=\pm\frac{b}{a}x$	$\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$	$\frac{x_1x}{a^2}-\frac{y_1y}{b^2}=1$
Parabola fokus $F\left(\frac{p}{2},0\right)$ direktrisa $x=-\frac{p}{2}$	$y^2=2px$	$y_1y=p(x+x_1)$

- Uvjet dodira pravca $y=kx+l$ i kružnice: $r^2(1+k^2)=(kp-q+l)^2$

Matematika

Knjižica formula

- Aritmetički niz: $a_n = a_1 + (n-1)\cdot d$, $S_n = \frac{n}{2}(a_1 + a_n)$
- Geometrijski niz: $a_n = a_1 \cdot q^{n-1}$, $S_n = a_1 \frac{q^n - 1}{q - 1}$
- Geometrijski red: $S = \frac{a_1}{1-q}, |q| < 1$

- Derivacija umnoška: $(f \cdot g)' = f' \cdot g + f \cdot g'$
- Derivacija kvocijenta: $\left(\frac{f}{g}\right)' = \frac{f' \cdot g - f \cdot g'}{g^2}$
- Derivacija kompozicije: $(f \circ g)'(x) = f'(g(x)) \cdot g'(x)$
- Tangenta na graf funkcije f u $T(x_1, y_1)$: $y - y_1 = f'(x_1) \cdot (x - x_1)$
- Derivacije:

$c' = 0$	$(x^n)' = n \cdot x^{n-1},\ n \neq 0$	$(\sin x)' = \cos x$	$(\cos x)' = -\sin x$	$(\operatorname{tg} x)' = \frac{1}{\cos^2 x}$

Matematika

MAT T A

99