$$(a \pm b)^2 = a^2 \pm 2ab + b^2$$
$$(a \pm b)^3 = a^3 \pm 3a^2b + 3ab^2 \pm b^3$$
$$a^2 - b^2 = (a-b)(a+b)$$
$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$
$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

$$a^{m+n} = a^m a^n$$
$$a^{mn} = (a^m)^n$$
$$a^{\frac{m}{n}} = \sqrt[n]{a^m}$$
$$a^{-m} = \frac{1}{a^m}$$
$$a^m b^m = (ab)^m$$
$$\frac{a^m}{b^m} = \left(\frac{a}{b}\right)^m$$
$$a^0 = 1$$

$$\ln(ab) = \ln a + \ln b$$
$$\ln\frac{a}{b} = \ln a - \ln b$$
$$\ln a^b = b \ln a$$
$$\ln e = 1$$
$$\ln 1 = 0$$

$$\sin^2\alpha + \cos^2\alpha = 1$$
$$\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$$
$$\cos(\alpha \pm \beta) = \cos\alpha\cos\beta \mp \sin\alpha\sin\beta$$
$$\sin 2\alpha = 2\sin\alpha\cos\alpha$$
$$\cos 2\alpha = \cos^2\alpha - \sin^2\alpha$$
$$1 + \cos\alpha = 2\cos^2\frac{\alpha}{2}$$
$$1 - \cos\alpha = 2\sin^2\frac{\alpha}{2}$$

$$\lim_{x\to 0}\frac{\sin x}{x} = 1$$
$$\lim_{x\to 0}\frac{\operatorname{tg} x}{x} = 1$$
$$\lim_{x\to 0}\frac{e^x - 1}{x} = 1$$
$$\lim_{x\to 0}\frac{\ln(1+x)}{x} = 1$$
$$\lim_{x\to\infty}\left(1 + \frac{1}{x}\right)^x = e$$
$$\lim_{x\to\infty}\left(1 - \frac{1}{x}\right)^x = \frac{1}{e}$$
$$\lim_{x\to 0}\left(1 + x\right)^{\frac{1}{x}} = e$$
$$\lim_{x\to 0}\left(1 - x\right)^{\frac{1}{x}} = \frac{1}{e}$$

$$c' = 0$$
$$(x^a)' = ax^{a-1} \ (a \neq 0)$$
$$(\sin x)' = \cos x$$
$$(\cos x)' = -\sin x$$
$$(\operatorname{tg} x)' = \frac{1}{\cos^2 x}$$
$$(\operatorname{ctg} x)' = -\frac{1}{\sin^2 x}$$
$$(a^x)' = a^x \ln a \ (a > 0)$$
$$(e^x)' = e^x$$
$$(\log_a x)' = \frac{1}{x \ln a} \ (a > 0, a = 1, x > 0)$$
$$(\ln x)' = \frac{1}{x} \ (x > 0)$$
$$(\arcsin x)' = \frac{1}{\sqrt{1 - x^2}} \ (|x| < 1)$$
$$(\arccos x)' = -\frac{1}{\sqrt{1 - x^2}} \ (|x| < 1)$$
$$(\operatorname{arctg} x)' = \frac{1}{1 + x^2}$$
$$(\operatorname{arcctg} x)' = -\frac{1}{1 + x^2}$$

$$\int dx = x + C$$
$$\int x^n \, dx = \frac{x^{n+1}}{n+1} + C \ (n \neq -1)$$
$$\int \frac{1}{x} \, dx = \ln|x| + C \ (x \neq 0)$$
$$\int a^x \, dx = \frac{a^x}{\ln a} + C \ (a > 0, a \neq 1)$$
$$\int e^x \, dx = e^x + C$$
$$\int \sin x \, dx = -\cos x + C$$
$$\int \cos x \, dx = \sin x + C$$
$$\int \frac{1}{\cos^2 x} \, dx = \operatorname{tg} x + C$$
$$\int \frac{1}{\sin^2 x} \, dx = -\operatorname{ctg} x + C$$
$$\int \frac{1}{\sqrt{a^2 - x^2}} \, dx = \arcsin\frac{x}{a} + C$$
$$\int \frac{1}{a^2 + x^2} \, dx = \frac{1}{a}\operatorname{arctg}\frac{x}{a} + C$$
$$\int \frac{1}{\sqrt{x^2 \pm a^2}} \, dx = \ln|x + \sqrt{x^2 \pm a^2}| + C$$

Površina ravnog lika: $P = \int_a^b f(x)\,dx$, za $f(x) \geq 0$, $x \in [a,b]$ Zapremina obrtnog tela: $V = \pi \int_a^b f^2(x)\,dx$

Dužina luka krive: $L = \int_a^b \sqrt{1 + (f'(x))^2}\,dx$ Površina obrtnog tela: $P_o = 2\,\pi \int_a^b f(x)\sqrt{1 + (f'(x))^2}\,dx$

Totalni diferencijal (opšta formula): $d^n f(x,y) = \left(\frac{\partial f}{\partial x}\,dx + \frac{\partial f}{\partial y}\,dy\right)^n$

$n = 1$: $df(x,y) = \frac{\partial f}{\partial x}\,dx + \frac{\partial f}{\partial y}\,dy$

$n = 2$: $d^2 f(x,y) = \frac{\partial^2 f}{\partial x^2}\,(dx)^2 + 2\frac{\partial^2 f}{\partial x \partial y}\,dx\,dy + \frac{\partial^2 f}{\partial y^2}\,(dy)^2$

$n = 3$: $d^3 f(x,y) = \frac{\partial^3 f}{\partial x^3}\,(dx)^3 + 3\frac{\partial^3 f}{\partial x^2 \partial y}\,(dx)^2\,dy + 3\frac{\partial^3 f}{\partial x \partial y^2}\,dx\,(dy)^2 + \frac{\partial^3 f}{\partial y^3}\,(dy)^3$

Oblik	Tip ODJ	Smena
$y' = f(x) \cdot g(y)$	razdvojene promenljive	–
$y' = f(ax + by + c)$	svodi se na razdvojene promenljive	$u(x) = ax + by(x) + c$
$y' = f\left(\frac{y}{x}\right)$	homogena	$u(x) = \frac{y(x)}{x}$
$y' = f\left(\frac{a_1 x + b_1 y + c_1}{a_2 x + b_2 y + c_2}\right)$	svodi se na homogenu ($a_1 b_2 - a_2 b_1 \neq 0$)	$x = X + \alpha$, $y = Y + \beta$ $\alpha = \frac{b_1 c_2 - b_2 c_1}{a_1 b_2 - a_2 b_1}$, $\beta = \frac{c_1 a_2 - c_2 a_1}{a_1 b_2 - a_2 b_1}$
$y' + f(x) \cdot y = g(x)$	linearna	$y(x) = u(x) \cdot v(x)$
$y' + f(x) \cdot y = g(x) \cdot y^\alpha$	Bernulijeva ($\alpha \neq 0, \alpha \neq 1$)	$z(x) = y^{1-\alpha}(x)$

Homogena ODJ v.r. sa k.k.	Oblik rešenja
$y^{(n)} + a_{n-1} y^{(n-1)} + \cdots + a_0 y = 0$	karakteristična jednačina (KJ): $r^n + a_{n-1} r^{n-1} + \ldots + a_1 r + a_0 = 0$ (i) $r_i \in \mathbb{R}$ koren KJ višestrukosti $k_i \Rightarrow$ $y_i = C_1^i\,e^{r_i x} + C_2^i\,x\,e^{r_i x} + \cdots + C_{k_i}^i\,x^{k_i - 1}\,e^{r_i x}$ (ii) $r_i = \alpha_i + \beta_i i$ koren KJ višestrukosti $k_i \Rightarrow$ $y_i = e^{\alpha_i x}\,\left(C_1^i \cos(\beta x) + C_2^i\,x\,\cos(\beta x) + \cdots + C_{k_i}^i\,x^{k_i - 1}\,\cos(\beta x)\right)$ $+\, e^{\alpha_i x}\,\left(D_1^i \sin(\beta x) + D_2^i\,x\,\sin(\beta x) + \cdots + D_{k_i}^i\,x^{k_i - 1}\,\sin(\beta x)\right)$ $y_h = y_1 + y_2 + \cdots + y_l, i = 1, 2, \ldots, l$ (l broj različitih korena KJ)

Binomni obrazac: $(a+b)^n = \sum_{k=1}^{n} \binom{n}{k} a^k b^{n-k} = \sum_{k=1}^{n} \binom{n}{k} a^{n-k} b^k$

$P_n = n!;$ $\bar{P}_n^{k_1,\dots,k_l} = \frac{n!}{k_1! \cdot \ldots \cdot k_l!};$ $V_n^k = n(n-1)\cdot \ldots \cdot (n-k+1);$ $\bar{V}_n^k = n^k;$ $C_n^k = \binom{n}{k}$

SLOŽENI KAMATNI RAČUN

$$G_n = G\left(1+\frac{p}{100}\right)^n; \qquad G = \frac{G_n}{\left(1+\frac{p}{100}\right)^n}; \qquad n = \frac{\ln \frac{G_n}{G}}{\ln\left(1+\frac{p}{100}\right)}; \qquad p = \left(\sqrt[n]{\frac{G_n}{G}} - 1\right)\cdot 100$$

S.K.R. SA ČEŠĆIM KAPITALISANJEM

$$G_{mn} = G\left(1+\frac{p}{100\cdot m}\right)^{m\cdot n}; \qquad G = \frac{G_{mn}}{\left(1+\frac{p}{100\cdot m}\right)^{m\cdot n}}; \qquad n = \frac{\ln G_{mn} - \ln G}{m\cdot \ln\left(1+\frac{p}{100\cdot m}\right)}; \qquad \text{neprecizna k.s.} = \frac{p}{m}$$

RAČUN ŠTEDNJE

$$S_n = U\,q\,\frac{q^n-1}{q-1}; \qquad U = \frac{S_n\,(q-1)}{q\,(q^n-1)}; \qquad n = \frac{\ln\left(1+\frac{S_n\,(q-1)}{U\,q}\right)}{\ln q}; \qquad q = 1+\frac{p}{100}$$

OTPLATA DUGA

$$R = D\,q^n\,\frac{q-1}{q^n-1}; \qquad D = \frac{R\,(q^n-1)}{q^n\,(q-1)}; \qquad n = \frac{\ln \frac{R}{R-D(q-1)}}{\ln q}; \qquad q = 1+\frac{p}{100}$$

KONFORMNA KAMATNA STOPA $\left(1+\frac{p_k}{100}\right)^s = 1+\frac{p}{100};$ $p_k = \left(\sqrt[s]{1+\frac{p}{100}} - 1\right)\cdot 100$

Indeksi	formula	veza
bazni	$B_i = \frac{y_i}{y_b}\cdot 100$	$B_i = \begin{cases} \frac{B_{i+1}}{V_{i+1}}\cdot 100, & i<b \\ 100\%, & i=b \\ \frac{B_{i-1}}{100}\cdot V_i, & i>b \end{cases}$
verižni	$V_i = \frac{y_i}{y_{i-1}}\cdot 100$	$V_i = \frac{B_i}{B_{i-1}}\cdot 100$

	Prosečna stopa rasta/pada
$y_i \nearrow$	$r_S = \left(\sqrt[n-1]{\frac{y_{\max}}{y_{\min}}} - 1\right)\cdot 100$
$y_i \searrow$	$p_S = \left(\sqrt[n-1]{\frac{y_{\min}}{y_{\max}}} - 1\right)\cdot 100$
inače	$rp_S = \frac{1}{n-1}\sum_{i=2}^{n}(V_i - 100)$

Aritmetički niz	Geometrijski niz
$n \in \mathbb{N}$	$n \in \mathbb{N}$
$a_n = a_1 + (n-1)d$	$a_n = a_1 q^{n-1}$
$S_n = a_1 n + \frac{n(n-1)}{2} d$	$S_n = a_1\,\frac{q^n-1}{q-1}$
$n = \frac{a_n - a_1}{d} + 1$	$n = \frac{\ln\left(1+\frac{S_n\cdot(q-1)}{a_1}\right)}{\ln q}$

Vektori

$\vec{a}=(a_1,a_2,a_3)=a_1\vec{i}+a_2\vec{j}+a_3\vec{k}$ $\quad \vec{b}=(b_1,b_2,b_3)=b_1\vec{i}+b_2\vec{j}+b_3\vec{k}$ $\quad \vec{c}=(c_1,c_2,c_3)=c_1\vec{i}+c_2\vec{j}+c_3\vec{k}$

$|\vec{a}|=\sqrt{a_1^2+a_2^2+a_3^2}$ $\quad \vec{a}\pm\vec{b}=(a_1\pm b_1,a_2\pm b_2,a_3\pm b_3)$ $\quad \alpha\vec{a}=(\alpha a_1,\alpha a_2,\alpha a_3),\alpha\in\mathbb{R}$

Skalarni proizvod	Vektorski proizvod	Mešoviti proizvod
$\vec{a}\cdot\vec{b}=\|\vec{a}\|\cdot\|\vec{b}\|\cdot\cos\angle(\vec{a},\vec{b})$	$\vec{a}\times\vec{b}=\begin{vmatrix}\vec{i}&\vec{j}&\vec{k}\\a_1&a_2&a_3\\b_1&b_2&b_3\end{vmatrix}$	$(\vec{a}\times\vec{b})\cdot\vec{c}=\begin{vmatrix}a_1&a_2&a_3\\b_1&b_2&b_3\\c_1&c_2&c_3\end{vmatrix}$
$\vec{a}\cdot\vec{b}=a_1b_1+a_2b_2+a_3b_3$	$\|\vec{a}\times\vec{b}\|=\|\vec{a}\|\cdot\|\vec{b}\|\cdot\sin\angle(\vec{a},\vec{b})$	
$\begin{array}{c\|ccc}\cdot&\vec{i}&\vec{j}&\vec{k}\\\hline\vec{i}&1&0&0\\\vec{j}&0&1&0\\\vec{k}&0&0&1\end{array}$	$\begin{array}{c\|ccc}\times&\vec{i}&\vec{j}&\vec{k}\\\hline\vec{i}&\vec{0}&\vec{k}&-\vec{j}\\\vec{j}&-\vec{k}&\vec{0}&\vec{i}\\\vec{k}&\vec{j}&-\vec{i}&\vec{0}\end{array}$	
$\vec{a}\perp\vec{b}\Leftrightarrow\vec{a}\cdot\vec{b}=0$	$\vec{a},\vec{b}$ su kolinearni $\Leftrightarrow\vec{a}\times\vec{b}=\vec{0}$	$\vec{a},\vec{b},\vec{c}$ su komplanarni $\Leftrightarrow(\vec{a}\times\vec{b})\cdot\vec{c}=0$
	Površina paralelograma nad $\vec{a}$ i $\vec{b}$: $P=\|\vec{a}\times\vec{b}\|$	Zapremina paralelopipeda nad $\vec{a},\vec{b}$ i $\vec{c}$: $V=\|(\vec{a}\times\vec{b})\cdot\vec{c}\|$

Ravan: T - proizvoljna tačka u ravni ($T(x,y,z)$)

$\vec{r}_T$ - vektor položaja tačke T ($\vec{r}_T = \overrightarrow{OT} = (x,y,z)$)

Normalni vektorski oblik jednačine ravni: $\vec{n}$ - vektor normale na ravan

$\vec{n}_0$ - jedinični vektor normale na ravan ($\vec{n}_0 = \frac{\vec{n}}{|\vec{n}|}$)

P - tačka prodora normale kroz ravan

$p = |\vec{r}_P|$

$$\vec{r}_T\vec{n}_0 - p = 0 \quad \text{ili} \quad \vec{r}_T\vec{n} - p|\vec{n}| = 0$$

Skalarni oblik jednačine ravni: $\vec{n} = A\vec{i} + B\vec{j} + C\vec{k}$

$D = -p|\vec{n}|$ ($\Rightarrow p = -\frac{D}{\pm\sqrt{A^2+B^2+C^2}}$ $(p > 0)$)

$$Ax + By + Cz + D = 0$$

Segmentni oblik jednačine ravni: $A, B, C, D \neq 0$

$$\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$$

Jednačina ravni kroz tačku $T_1(x_1, y_1, z_1)$ koja je normalna na vektor $\vec{n} = (A, B, C)$:

$$Ax + By + Cz - Ax_1 - By_1 - Cz_1 = 0$$

Jednačina ravni kroz tri tačke: $T_1(x_1, y_1, z_1), T_2(x_2, y_2, z_2), T_3(x_3, y_3, z_3)$:

$$\begin{vmatrix} x - x_1 & y - y_1 & z - z_1 \\ x_2 - x_1 & y_2 - y_1 & z_2 - z_1 \\ x_3 - x_1 & y_3 - y_1 & z_3 - z_1 \end{vmatrix} = 0$$

Ugao između dve ravni α i β: $\vec{n}_\alpha = (A_1, B_1, C_1)$ - normala na α

$\vec{n}_\beta = (A_2, B_2, C_2)$ - normala na β

$$\cos\angle(\alpha, \beta) = \left|\frac{A_1A_2 + B_1B_2 + C_1C_2}{\sqrt{A_1^2 + B_1^2 + C_1^2}\sqrt{A_2^2 + B_2^2 + C_2^2}}\right|$$

$$\alpha \perp \beta \Leftrightarrow A_1A_2 + B_1B_2 + C_1C_2 = 0$$

$$\alpha \parallel \beta \Leftrightarrow \vec{n}_\alpha, \vec{n}_\beta \text{ kolinearni}$$

Rastojanje tačke $T_1(x_1, y_1, z_1)$ od ravni $\alpha : Ax + By + Cz + D = 0$:

$$d = \left|\frac{Ax_1 + By_1 + Cz_1 + D}{\sqrt{A^2 + B^2 + C^2}}\right|$$

Prava (u $\mathbb{R}^3$): T - proizvoljna tačka na pravoj ($T(x,y,z)$)

$\vec{r}_T$ - vektor položaja tačke T ($\vec{r}_T = \overrightarrow{OT} = (x,y,z)$)

$\vec{a}$ - vektor pravca prave ($\vec{a} = (a_1, a_2, a_3)$)

Vektorski oblik jednačine prave kroz tačku T_1: $\overrightarrow{TT_1} = t\vec{a}, t \in \mathbb{R}$

$$\vec{r}_T = \vec{r}_{T_1} + t\vec{a}$$

Parametarske jednačine prave kroz tačku $T_1(x_1, y_1, z_1)$:

$$\begin{aligned} x &= x_1 + ta_1 \\ y &= y_1 + ta_2 \\ z &= z_1 + ta_3 \end{aligned}$$

Kanoničke jednačine prave kroz tačku $T_1(x_1, y_1, z_1)$:

$$\frac{x - x_1}{a_1} = \frac{y - y_1}{a_2} = \frac{z - z_1}{a_3}$$

Jednačina prave kroz dve tačke $T_1(x_1, y_1, z_1)$ i $T_2(x_2, y_2, z_2)$:

$$\frac{x - x_1}{x_2 - x_1} = \frac{y - y_1}{y_2 - y_1} = \frac{z - z_1}{z_2 - z_1}$$

Rastojanje tačke $T_2(x_2, y_2, z_2)$ od prave $p : \frac{x - x_1}{a_1} = \frac{y - y_1}{a_2} = \frac{z - z_1}{a_3}$: $T_1(x_1, y_1, z_1)$

$$d = \frac{|\overrightarrow{T_1T_2} \times \vec{a}|}{|\vec{a}|}$$

Rastojanje između dve prave $p_1 : \frac{x - x_1}{a_1} = \frac{y - y_1}{a_2} = \frac{z - z_1}{a_3}$ i $p_2 : \frac{x - x_2}{b_1} = \frac{y - y_2}{b_2} = \frac{z - z_2}{b_3}$:

$$p_1 \parallel p_2 \Rightarrow d(p_1, p_2) = d(T_1, p_2), T_1 \in p_1 \text{ proizvoljna}$$

$$p_1, p_2 \text{ mimoilazne } \Rightarrow d(p_1, p_2) = \left| \frac{\begin{vmatrix} x_2 - x_1 & y_2 - y_1 & z_2 - z_1 \\ a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{vmatrix}}{\sqrt{\begin{vmatrix} a_2 & a_3 \\ b_2 & b_3 \end{vmatrix}^2 + \begin{vmatrix} a_3 & a_1 \\ b_3 & b_1 \end{vmatrix}^2 + \begin{vmatrix} a_1 & a_2 \\ b_1 & b_2 \end{vmatrix}^2}} \right|$$

Ugao između dve prave $p_1 : \frac{x - x_1}{a_1} = \frac{y - y_1}{a_2} = \frac{z - z_1}{a_3}$ i $p_2 : \frac{x - x_2}{b_1} = \frac{y - y_2}{b_2} = \frac{z - z_2}{b_3}$:

$$\cos \angle(p_1, p_2) = \frac{a_1b_1 + a_2b_2 + a_3b_3}{\sqrt{a_1^2 + a_2^2 + a_3^2}\sqrt{b_1^2 + b_2^2 + b_3^2}}$$

Ugao između prave $p : \frac{x - x_1}{a_1} = \frac{y - y_1}{a_2} = \frac{z - z_1}{a_3}$ i ravni $\alpha : Ax + By + Cz + D = 0$:

$$\sin \angle(p, \alpha) = \cos \angle(\vec{a}, \vec{n}) = \left| \frac{Aa_1 + Ba_2 + Ca_3}{\sqrt{a_1^2 + a_2^2 + a_3^2}\sqrt{A^2 + B^2 + C^2}} \right|$$