

Progresii aritmetice

Exemplu: 1, 3, 5, 7, ..., 27

$$a_n = a_{n-1} + r$$

$$a_n = a_1 + (n-1)r$$

$$a_n = \frac{a_{n-1} + a_{n+1}}{2}$$

$$S_n = \frac{a_1 + a_n}{2} \cdot n$$

Progresii geometrice

Exemplu: 2, 4, 8, 16, ..., 1024

$$b_n = b_{n-1} \cdot q$$

$$b_n = b_1 \cdot q^{n-1}$$

$$b_n^2 = b_{n-1} \cdot b_{n+1}$$

$$S_n = b_1 \cdot \frac{q^n - 1}{q - 1}$$

Numere complexe

$$z = a + bi$$

$$\bar{z} = z \cdot \bar{z}$$

$$|z| = \sqrt{a^2 + b^2}$$

$$|z|^2 = z \cdot \bar{z}$$

$$\left| \frac{z_1}{z_2} \right| = \frac{|z_1|}{|z_2|}$$

$$|z| = |\bar{z}|$$

$$i^{4k} = 1$$

$$i^{4k+2} = -1$$

$$i^{4k+1} = i$$

$$i^{4k+3} = -i$$

Vectori

$$\overrightarrow{AB} = (x_B - x_A)\vec{i} + (y_B - y_A)\vec{j}$$

$$|\overrightarrow{AB}| = \sqrt{(x_B - x_A)^2 + (y_B - y_A)^2}$$

$$\vec{u} = a\vec{i} + b\vec{j}$$

$$\vec{v} = c\vec{i} + d\vec{j}$$

$$|\vec{u}| = \sqrt{a^2 + b^2}$$

$$\vec{u} \parallel \vec{v} \text{ sau coliniare} \Leftrightarrow \frac{a}{c} = \frac{b}{d}$$

$$\vec{u} \perp \vec{v} \Leftrightarrow a \cdot c + b \cdot d = 0$$

$$\vec{u} \cdot \vec{v} = a \cdot c + b \cdot d$$

$$\cos(\vec{u}, \vec{v}) = \frac{\vec{u} \cdot \vec{v}}{|\vec{u}| \cdot |\vec{v}|}$$

Ecuatii de gradul II

$$V\left(-\frac{b}{2a}, -\frac{\Delta}{4a}\right) \quad x = x_V - \text{axa de sim. parabolei}$$

$$G_f \text{ e parabolă - convexă dacă } a > 0 \cup f > 0 \quad \forall X \in \mathbb{R} \Leftrightarrow \Delta < 0$$

$$\text{- concavă dacă } a < 0 \cap f < 0 \quad \forall X \in \mathbb{R} \Leftrightarrow \Delta < 0$$

$$G_f \text{ e tg axei } OX \Leftrightarrow \Delta = 0$$

$$\text{Relațiile lui Viète: } S = x_1 + x_2 = -\frac{b}{a}$$

$$P = x_1 \cdot x_2 = \frac{c}{a}$$

$$x_1^2 + x_2^2 = S^2 - 2P$$

Geometrie analitică

$$d: ax + by + c = 0$$

$$m_d = -\frac{a}{b}$$

$$d: y = mx + n$$

$$m_d = m$$

$$AB: \frac{y - y_A}{y_B - y_A} = \frac{x - x_A}{x_B - x_A}$$

$$AB = \sqrt{(x_B - x_A)^2 + (y_B - y_A)^2}$$

$$m_{AB} = \frac{y_B - y_A}{x_B - x_A}$$

M mijlocul lui AB

$$x_M = \frac{x_A + x_B}{2}$$

$$y_M = \frac{y_A + y_B}{2}$$

G centrul de greutate al $\triangle ABC$

$$x_G = \frac{x_A + x_B + x_C}{3}$$

$$y_G = \frac{y_A + y_B + y_C}{3}$$

$$d_1: a_1x + b_1y + c_1 = 0$$

$$\Delta = \begin{vmatrix} x_A & y_A & 1 \\ x_B & y_B & 1 \\ x_C & y_C & 1 \end{vmatrix}$$

$$A_{\triangle ABC} = \frac{1}{2} |\Delta|$$

$$d_2: a_2x + b_2y + c_2 = 0$$

$$A, B, C \text{ col} \Leftrightarrow \Delta = 0$$

$$d_1 \parallel d_2 \Leftrightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2}$$

$$d_1 \perp d_2 \Leftrightarrow a_1a_2 + b_1b_2 = 0$$

Ecuatia dreptei care trece prin A și are panta m

$$d_1: y = m_1x + n_1$$

$$y - y_A = m(x - x_A)$$

$$d_2: y = m_2x + n_2$$

$$d_1 \parallel d_2 \Leftrightarrow m_1 = m_2$$

$$d_1 \perp d_2 \Leftrightarrow m_1 \cdot m_2 = -1$$

$$\triangle \text{oarecare} \quad T \cos: BC^2 = AB^2 + AC^2 - 2AB \cdot AC \cdot \cos A \quad T \sin: \frac{BC}{\sin A} = \frac{AC}{\sin B} = \frac{AB}{\sin C} = 2R$$

Combinatorică

$$P_n = n!$$

$$A_n^K = \frac{n!}{(n-K)!}$$

$$C_n^K = \frac{n!}{K!(n-K)!}$$

$$Z^n = C_n^0 + C_n^1 + C_n^2 + \dots + C_n^n$$

$$(a+b)^n = C_n^0 \cdot a^n + C_n^1 \cdot a^{n-1} \cdot b + C_n^2 \cdot a^{n-2} \cdot b^2 + \dots + C_n^n \cdot b^n$$

$$T_{K+1} = C_n^K \cdot a^{n-K} \cdot b^K$$

Nr. de submulțimi ale unei mulțimi cu n elemente este 2^n

Funcții exponențiale

Funcții logaritmice

$$a^0 = 1$$

$$a^{-x} = \frac{1}{a^x}$$

$$\log_a 1 = 0$$

$$\log_a a = 1$$

$$\log_a x^n = n \log_a x$$

$$a^{x+y} = a^x \cdot a^y$$

$$a^{x-y} = \frac{a^x}{a^y}$$

$$\log_a x = \frac{1}{\log_x a}$$

$$\log_a \frac{1}{x} = -\log_a x$$

$$\log_{a^p} x = \frac{1}{p} \log_a x$$

$$(a^x)^p = a^{x \cdot p}$$

$$\frac{p}{q} = \sqrt[q]{a^p}$$

$$\log_a x = \frac{\log_b x}{\log_b a}$$

$$\log_a (x \cdot y) = \log_a x + \log_a y$$

$$a > 1 \Rightarrow f. \text{ cresc.}$$

$$\log_{10} x = \lg x \text{ (zecimal)}$$

$$\log_a \frac{x}{y} = \log_a x - \log_a y$$

$$0 < a < 1 \Rightarrow f. \text{ descr.}$$

$$\log_e x = \ln x \text{ (natural)}$$

$$e=2,7$$

Trigonometrie

Fomula fundamentală a trigonometriei $\sin^2 x + \cos^2 x = 1$

$$\sin 2x = 2 \sin x \cdot \cos x$$

$$\sin(\pi - x) = \sin x$$

$$\cos 2x = \cos^2 x - \sin^2 x$$

$$\cos(\pi - x) = -\cos x$$

$$= 1 - 2 \sin^2 x$$

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

$$= 2 \cos^2 x - 1$$

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

$$\operatorname{tg} 2x = \frac{2 \operatorname{tg} x}{1 - \operatorname{tg}^2 x}$$

$$\cos(x + \pi) = -\cos x$$

$$\operatorname{ctg} 2x = \frac{\operatorname{ctg}^2 x}{2 \operatorname{ctg} x}$$

$$\sin(x + \pi) = -\sin x$$

	$30^\circ = \frac{\pi}{6}$	$45^\circ = \frac{\pi}{4}$	$60^\circ = \frac{\pi}{3}$
sin	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$
cos	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$
tg	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$
ctg	$\sqrt{3}$	1	$\frac{\sqrt{3}}{3}$

$$\sin(a+b) = \sin a \cos b + \cos a \sin b$$

$$\sin 90^\circ = 1$$

$$\sin 0^\circ = 0$$

$$\sin 180^\circ = 0$$

$$\sin(a-b) = \sin a \cos b - \cos a \sin b$$

$$\cos 90^\circ = 0$$

$$\cos 0^\circ = 1$$

$$\cos 180^\circ = -1$$

$$\cos(a+b) = \cos a \cos b - \sin a \sin b$$

$$\cos(a-b) = \cos a \cos b + \sin a \sin b$$