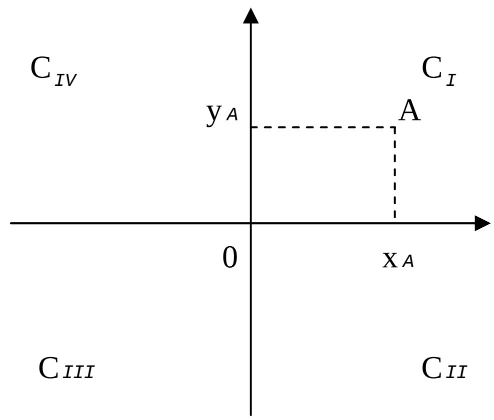
GEOMETRIE ANALITICA IN PLAN
(clasa a 11-a)

$A(x_A, y_A)$
$x_A > 0,\ y_A > 0 \Rightarrow A \in C_I$
$x_A < 0,\ y_A > 0 \Rightarrow A \in C_{II}$
$x_A < 0,\ y_A < 0 \Rightarrow A \in C_{III}$
$x_A > 0,\ y_A < 0 \Rightarrow A \in C_{IV}$
$x_A > 0,\ y_A = 0 \Rightarrow A \in (Ox$
$x_A < 0,\ y_A = 0 \Rightarrow A \in (Ox^{/}$
$x_A = 0,\ y_A > 0 \Rightarrow A \in (Oy$
$x_A = 0,\ y_A < 0 \Rightarrow A \in (Oy^{/}$
$x_A = y_A = 0 \Rightarrow A = 0$
$x_A \in \mathbf{R},\ y_A = 0 \Rightarrow A \in Ox$
$x_A = 0,\ y_A \in \mathbf{R} \Rightarrow A \in Oy$



Distanta dintre doua puncte $A(x_A, y_A)$, $B(x_B, y_B)$
$AB = \sqrt{(x_A - x_B)^2 + (y_A - y_B)^2}$

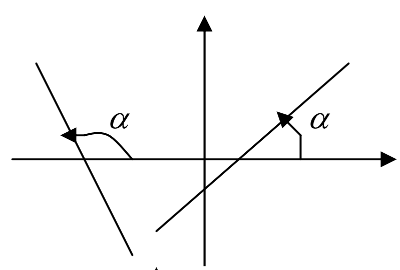
Mijlocul unui segment $M \in [AB]$ astfel incat $[AM] \equiv [MB]$
$x_M = \frac{x_A + x_B}{2}$, $y_M = \frac{y_A + y_B}{2}$

Punctul care imparte un segment intr-un raport dat DE [AB] astfel incat $\frac{AD}{DB} = k$

$x_D = \frac{x_A + kx_B}{1+k}$, $y_D = \frac{y_A + ky_B}{1+k}$

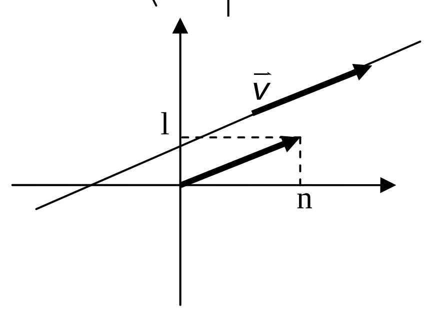
Centrul de greutate G al unui triunghi ABC:
$x_G = \frac{x_A + x_B + x_C}{3}$, $y_G = \frac{y_A + y_B + y_C}{3}$

Panta unei drepte
$m_d = tg\,\alpha$, unde α = unghiul dintre axa [Ox si d, considerat in sens trigonometric, daca d||Oy
Observatie: $m_d = 0 \Leftrightarrow d//Ox$



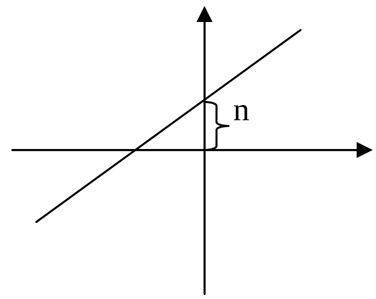
Panta dreptei determinata de punctele A si B: $m_{AB} = \frac{y_A - y_B}{x_A - x_B}$

Panta dreptei determinata de directia vectorului $\vec{v}(l, n)$
$\vec{v} = l\vec{i} + n\vec{j}$ este $m_d = \frac{n}{l}$



Panta dreptei ax + by + c = 0 este $-\frac{a}{b}$.

Ecuatia dreptei



Ecuatia dreptei de panta m si care trece prin punctul $A(x_A, y_A)$

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

Ecuatia explicita

d: y = mx + n, unde m = **panta dreptei**, n = **ordonata la origine**

Ecuatia dreptei care trece prin doua puncte $A(x_A, y_A)$, $B(x_B, y_B)$

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

daca $x_A = x_B \Rightarrow$ AB//Oy AB are ecuatia $x = x_A$

daca $y_A = y_B \Rightarrow$ AB//Ox AB are ecuatia $y = y_A$

Ecuatia dreptei de directie $\vec{v}(l, n)$ si care trece prin $A(x_A, y_A)$

AB: $\frac{x - x_A}{l} = \frac{y - y_A}{n}$

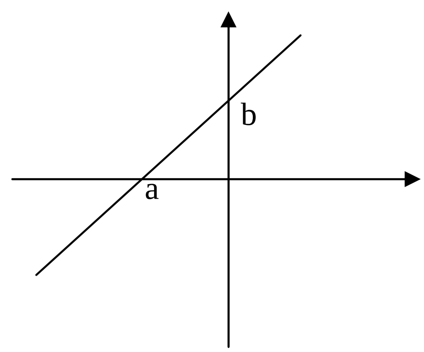
Ecuatiile parametrice ale unei drepte

AB: $\frac{x - x_A}{x_B - y_A} = \frac{y - y_A}{y_B - y_A} = t \Rightarrow$ AB: $\begin{cases} x = (x_B - y_A)t + x_A \\ y = (y_B - y_A)t + y_B \end{cases}$

AB: $\frac{x - x_A}{l} = \frac{y - y_A}{n} = t \Rightarrow$ AB: $\begin{cases} x = lt + x_A \\ y = nt + y_A \end{cases}$

Ecuatia sub forma de determinant

AB: $\begin{vmatrix} x & y & 1 \\ x_A & y_A & 1 \\ x_B & y_B & 1 \end{vmatrix} = 0$



Ecuatia prin taieturi

A(a, 0), B(0, b) $\Rightarrow$ AB: $\frac{x}{a} + \frac{y}{b} = 1$

Ecuatia generala a dreptei

d: ax + by + c = 0, a, b, c $\in \mathbf{R}$, a si b nu sunt simultan nule

Observatii: $a = 0 \Rightarrow b \neq 0 \Rightarrow$ d: $y = -\frac{c}{b} \Rightarrow$ d//Ox

$b = 0 \Rightarrow a \neq 0 \Rightarrow$ d: $x = -\frac{c}{a} \Rightarrow$ d//Oy

$a \neq 0$, $b \neq 0 \Rightarrow$ d//Ox, d//Oy

$c = 0 \Rightarrow O \in d$

Panta dreptei este $m_d = -\frac{a}{b}$ (coeficientul lui x cand izolam pe y)

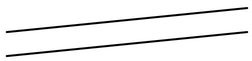
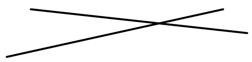
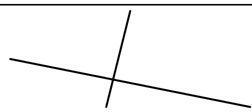
Directia dreptei este $\vec{v} = (ak, bk)$, $k \in \mathbf{R}^*$

Conditia de apartenenta la o dreapta

$A(x_A, y_A)$, d: ax + by + c = 0

$A \in d \Rightarrow ax_A + by_A + c = 0$

Pozitii relative ale dreptelor

	$d_1: a_1x + b_1y + c_1 = 0$ $d_2: a_2x + b_2y + c_2 = 0$	$d_1: y = m_1x + n_1$ $d_2: y = m_2x + n_2$
$d_1 = d_2$ 	$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	$\begin{cases} m_1 = m_2 \\ n_1 = n_2 \end{cases}$
$d_1 // d_2$ 	$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	$\begin{cases} m_1 = m_2 \\ n_1 \neq n_2 \end{cases}$
$d_1 \neq d_2$ $d_1 \cap d_2 \neq \Phi$ 	$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	$m_1 \neq m_2$
$d_1 \perp d_2$ 	$a_1a_2 + b_1b_2 = 0$	$m_1 m_2 = -1$

Conditia de coliniaritate

A, B, C sint coliniare $\Leftrightarrow$ A $\in$ BC

sau $\begin{vmatrix} x_A & y_A & 1 \\ x_B & y_B & 1 \\ x_C & y_C & 1 \end{vmatrix} = 0$

Conditia de concurenta a trei drepte

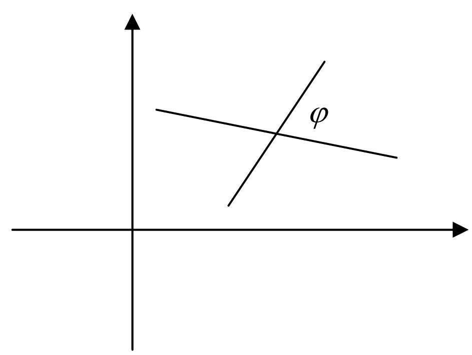
$d_1: a_1x + b_1y + c_1 = 0$

$d_2: a_2x + b_2y + c_2 = 0$

$d_3: a_3x + b_3y + c_3 = 0$

d_1, d_2, d_3 sunt concurente $\Leftrightarrow \begin{cases} \{A\} = d_1 \cap d_2 \\ A \in d_3 \end{cases}$

sau rang $\begin{pmatrix} a_1 & b_1 \\ a_2 & b_2 \\ c_1 & c_2 \end{pmatrix} = 0$ si $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 0$



Unghiul dintre doua drepte de pante m_1, m_2

$\operatorname{tg}\varphi = \left|\frac{m_1 - m_2}{1 + m_1m_2}\right|, \ \varphi \in \left[0, \frac{\pi}{2}\right)$

Distanta de la un punct A la o dreapta h

$A(x_A, y_A)$, h: ax + by + c = 0

$d(A, h) = \frac{|ax_A + by_A + c|}{\sqrt{a^2 + b^2}}$

Aria unui triunghi ABC

$\Delta = \begin{vmatrix} x_A & y_A & 1 \\ x_B & y_B & 1 \\ x_C & y_C & 1 \end{vmatrix}$ $\qquad A_{\Delta ABC} = \frac{1}{2}|\Delta|$