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Geometry 1 (Analytic Geometry)

Exercise Sheet 6

Exercise 1. The sides $[BC]$, $[CA]$, $[AB]$ of the triangle $\triangle ABC$ are divided by the points M, N respectively P into the same ratio k. Prove that the triangles $\triangle ABC$ and $\triangle MNP$ have the same center of mass.

Exercise 2. Find the equation of the line passing through the intersection point of the lines $d_1 : 2x - 5y - 1 = 0$ and $d_2 : x + 4y - 7 = 0$ and through a point M which divides the segment $[AB]$, given by $A(4, -3)$ and $B(-1, 2)$, into the ratio $k = 2/3$.

Exercise 3. Let A be a mobile point on the Ox axis and B a mobile point on Oy, so that for a constant $k > 0$:

$$\frac{1}{OA} + \frac{1}{OB} = k$$

Prove that for every one of the quadrants Q_I, Q_{II}, Q_{III}, Q_{IV} the lines AB situated inside it pass through a fixed point.

Exercise 4. Find the equation of the line passing through the intersection point of $d_1 : 3x - 2y + 5 = 0$, $d_2 : 4x + 3y - 1 = 0$ and intersecting the Oy axis at the point A with $OA = 3$.

Exercise 5. Find the parametric equations of the line through P_1 and P_2, when

(a) $P_1(3, -2)$, $P_2(5, 1)$;

(b) $P_1(4, 1)$, $P_2(4, 3)$.

Exercise 6. Find the parametric equations of the line through $P(-5, 2)$ and parallel to $\bar{v}(2, 3)$.

Exercise 7. Show that the equations $x = 3 - t$, $y = 1 + 2t$ and $x = -1 + 3t$, $y = 9 - 6t$. represent the same line.

Exercise 8. Find the vector equation of the line passing through P_1 and P_2, when

(a) $P_1(2, -1)$, $P_2(-5, 3)$;

(b) $P_1(0, 3)$, $P_2(4, 3)$.