1. Planar analytic geometry

1.1. Points $A = [2, 5]$, $B = [2, 1]$ and $C = [4, 7]$ are given. Line p passes through point A and is parallel to line BC, line q passes through point C and is perpendicular to line AB. Write down
- parametric equations of line p and q,
- general equation of both lines,
- parametric equations of line segment AB and ray AB with start point A.

1.2. Points $A = [-5, 18]$ and $B = [-14, 6]$ are given. Write down parametric, general, slope and intercept equations of line AB.

1.3. Determine equation of line p passing through point $A = [-1, -2.5]$ with slope $90°$.

1.4. Line p is given by $y = -1$. Write down its parametric equations.

1.5. Write down slope equation of line p that passes through point $A = [2, -2\sqrt{2}]$ and is perpendicular to line $q : y = x\sqrt{2} - 3$.

1.6. Determine the distance between point $A = [3, -2]$ and line $p : 2x - y + 3 = 0$.

1.7. Determine the mutual position of lines $p : x(t) = 5 - 7t, y(t) = 4 - 14t, t \in \mathbb{R}$ and $q : x(s) = 18 - 3s, y(s) = 17 - s, s \in \mathbb{R}$. In case of intersecting lines determine the angle between them and coordinates of their point of intersection. Write the equation of line r parallel to line p, where r passes through point $A = [18, 17]$.

1.8. Triangle ABC is given by its vertices $A = [-2, -4]$ and $B = [4, -2]$ and the point of intersection of altitudes $V = [2, -1]$. Determine the coordinates of point C.

1.9. Determine equation of line p passing through point $B = [2, 3]$ and forming angle $45°$ with line $q : 2x + 5y - 5 = 0$.

1.10. Decide, whether ray $p : x(t) = 5 - 3t, y(t) = 2 + 2t, t \in [0; \infty)$ intersects the line segment AB, $A = [1, 2]$, $B = [4, 8]$. If so, determine the coordinates of their point of intersection.

1.11. Determine coordinates of vertices, magnitudes of inner angles, altitude v_b and area of triangle ABC sides of which lie on lines $p : x - 3y + 11 = 0$, $q : 11x - 3y - 29 = 0$ and $r : 3x + y + 3 = 0$.

1.12. Parallelogram $ABCD$ is given by vertices $A = [1, -3]$ and $C = [13, 7]$, the direction vector of line AB is $u = (5, 2)$ and direction vector of BD is $v = (8, -2)$. Determine coordinates of vertices B and D.

1.13. Points $A = [1, 0]$ and $B = [-4, 3]$ are given. Determine points X on x-axis and Y on y-axis to satisfy $|AX| = |OY|$ and line XY passes through point B.

Conics

1.14. The circle $c : x^2 + y^2 - 6x + 4y + 8 = 0$ is given.
- Determine the centre and radius of the circle.
- Determine equations of tangent lines t_1 and t_2 to circle c, passing through point $P = [2, 1]$.

1.15. Write down equation of circle c passing through points $A = [2, 1]$, $B = [3, 0]$ and $C = [0, 5]$. Determine the centre and radius of the circle.

1.16. Determine the type, centre/vertex of conic c and its points of intersection with axes x and y and draw it. Conic is given by equation $c : 12x + 5y^2 - 6y + 57 = 0$.

1.17. Determine the type, centre/vertex of conic c and its points of intersection with axes x and y and draw it. Conic is given by equation $c : 4x^2 - 8x + y^2 + 4y + 4 = 0$.

1.18. Determine the type, centre/vertex of conic c and its points of intersection with axes x and y and draw it. Conic is given by equation $c : xy + 3x - 2y - 4 = 0$.

Regions

1.19. Region D (in the plane) is bordered by curves $x = 2$, $y = x$, $xy = 1$. Determine their points of intersections and boundary curves and draw the region.

1.20. Region D (in the plane) is bordered by curves $x + y = 4$, $x + y = 12$, $y^2 = 2x$. Determine their points of intersections and boundary curves and draw the region.

1.21. Region D (in the plane) is given by inequalities: $|x - 2| - 1 \leq y \leq 3$. Determine boundary curves, points of intersection and draw the region.

1.22. Region D (in the plane) is given by inequalities: $y^2 - x^2 \leq 2$, $x^2 \leq 4$, $y \geq -1$. Determine boundary curves, points of intersection and draw the region.

1.23. Region D (in the plane) is given by inequalities: $1 \leq x^2 + y^2 \leq 4$, $y \leq 0$, $x \leq 0$. Determine boundary curves, points of intersection and draw the region.

1.24. Region D (in the plane) is given by inequalities: $x \geq 0$, $1 \leq y \leq 2$, $y^2 = x$. Determine boundary curves, points of intersection and draw the region.