

Analytical Geometry and Linear Algebra I, Class #12

Innopolis University, November 2022

1 Polar coordinates

1. Find the equation of the line joining the points $\begin{bmatrix} 2 \\ \frac{\pi}{3} \end{bmatrix}$ and $\begin{bmatrix} 3 \\ \frac{\pi}{6} \end{bmatrix}$. It should deduce that this line also passes through the point $\begin{bmatrix} 6 \\ 3\sqrt{3} - 2 \\ \frac{\pi}{2} \end{bmatrix}$.
2. Find the equation of the line perpendicular to $\frac{l}{r} = \cos(\theta - \alpha) + e \cos(\theta)$ and passing through the point $\begin{bmatrix} r_1 \\ \theta_1 \end{bmatrix}$.
3. Show that the feet of the perpendiculars from the origin on the sides of the triangle formed by the points with vectorial angles α, β, γ and which lie on the circle $r = 2a \cos(\theta)$ lie on the straight line $2a \cos(\alpha) \cos(\beta) \cos(\gamma) = r \cos(\pi - \alpha - \beta - \gamma)$.
4. A focal chord SP of an ellipse is inclined at an angle α to the major axis. Prove that the perpendicular from the focus on the tangent at P makes with the axis an angle $\arctan\left(\frac{\sin(\alpha)}{e + \cos(\alpha)}\right)$.