

# Essentials of Analytical Geometry and Linear Algebra I, Class #14

Innopolis University, September 2020

## 1 Conic, Cylinder

1. Find the equation of the cone with its vertex at  $(1, 1, 1)$  and which passes through the curve  $x^2 + y^2 = 4, z = 2$ .
2. Find the equation of the cone with its vertex at the origin and which passes through the curve  $ax^2 + by^2 + cz^2 - 1 = 0 = \alpha x^2 - \beta y^2 - 2z$
3. Find the equation of the cone of the second degree which passes through the axes.
4. Find the equation of the right circular cone whose vertex is at the origin, whose axis is the line  $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$  and which has a vertical angle of  $60^\circ$
5. Find the equation of the cylinder whose generators are parallel to the line  $\frac{x}{-1} = \frac{y}{2} = \frac{z}{3}$  and whose guiding curve is  $x^2 + y^2 = 9, z = 1$
6. Find the equations of the right circular cylinder of radius 3 with equations of axis as  $\frac{x-1}{2} = \frac{y-0}{3} = \frac{z-5}{-1}$
7. Find the equation of the enveloping cylinder of the sphere  $x^2 + y^2 + z^2 - 2x + 4y = 1$  having its generators parallel to the line  $x = y = z$

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## 2 Conic, Cylinder

1. Find the equation of the cone whose vertex is at the origin and which passes through the curve of intersection of the plane  $lx + my + nz = p$  and surface,  $ax^2 + by^2 + cz^2 = 1$

**Ans:**  $p^2(ax^2 + by^2 + cz^2) = (lx + my + nz)^2$

2. Find the equation to the cone whose vertex is the origin and the base circle  $x = a, y^2 + z^2 = b^2$  and show that the section of the cone by a plane parallel to the  $xy$ -plane is hyperbola.

**Ans:**  $a^2(y^2 + z^2) = b^2x^2$

3. Find the equation of the cylinder, whose guiding curve is  $x^2 + z^2 - 4x - 2z + 4 = 0, y = 0$  and whose axis contains the point  $(0, 3, 0)$ .

**Ans:**  $10x^2 + 5y^2 + 13z^2 + 12xy + 4xz + 6yz - 36x - 30y - 18z + 36 = 0$