Progressive Education Society's
Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune - 5

F.Y.B.Sc. Mathematics (Semester - II)
Subject: Analytical Geometry
Practical 1 : Analytical Geometry in two dimensions

1. Find the transformed form of the equation $x^2 + 4xy + y^2 = 0$ when the axes are rotated through an angle $\tan^{-1} 3$ without shifting the origin.
2. Find the centre of the conic represented by the equation $7x^2 + 12xy + 2y^2 - 3x + 8 = 0$ and also remove the product term from the equation.
3. Discuss the nature of the conic and reduce the equation to the standard form $17x^2 - 12xy + 8y^2 + 46x - 28y + 17 = 0$.
4. Show that the equation $x^2 + 4xy + y^2 - 2x + 2y - 6 = 0$ represents a hyperbola. Find the eccentricity, length of conjugate axis , length of transverse axis and latus rectum.
5. Show that the equation $9x^2 - 24xy + 16y^2 - 2x - 39y - 11 = 0$ represents a parabola. Find its vertex, focus, equation of directrix and latus rectum.

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F.Y.B.Sc. Mathematics (Semester - II)
Subject: Analytical Geometry
Practical 2 : Three Dimensional System

1. Show that the lines whose direction cosines are connected by the relation $3l+4m+5n=0$ and $l^2+m^2-n^2=0$ are parallel.
2. Show that the two lines whose direction cosines are conneted by relation $2l-m+2n=0$ and $lm+mn+nl=0$
3. Using direction ratios show that the four points $(3,6,2),(2,3,0),(-4,1,-4),(5,2,1)$ are coplanar.
4. A line in space makes angle $45°$ with X - axis and $30°$ with Y-axis . State whether this can be true or false giving proper justification.
5. A lines in the XY-plane makes angle $30°$ with x-axis . Find it's direction cosines.
6. Check whether the triangle ABC with vertices $A(1,-1,1),B(2,1,0),C(-1,3,2)$ is equilateral triangle.
7. By using direction cosines , prove that the points $P(-3,2,1),Q(6,-1,-5),R(\frac{-3}{2},\frac{3}{2},0)$ are collinear and find the ratio in which R divides PQ.
8. Show that the join of points $(1,2,3),(4,5,7)$ is parallel to the join of the points $(-4,3,-6),(2,9,2)$.

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F.Y.B.Sc. Mathematics (Semester - II)
Subject: Analytical Geometry
Practical 3 : Planes

1. Find the angle between the planes $x+2y-3z=1$ and $3x-2y-z=2$.
2. Find the equation of the plane which passes through $(1,1,2)$ and is perpendicular to the two planes $x-y-z=1$ and $2x+3z=4$.
3. Find the equation of the plane passing through the point $(2,0,3)$ and makes intercepts on the axes which are in the ratio $3:1:2$.
4. Find the equation of bisector plane bisecting angle between the planes $3x-6y+2z+5=0$, $4x-12y+3z-3=0$.
5. Show that the equation $2x^2-2y^2+4z^2+6xz+2yz+3xy=0$ represents a pair of planes and also find the angles between the planes .
6. Find the equation of the plane passing through the line of intersection $x+y-z+1=0, 2x-y+2z+3=0$ at a distance of unity from origin.
7. Find the distance of the points $(2,3,4)$ and $(1,1,4)$ from the plane $3x-6y+2z+11=0$.
8. Find the distance between the parallel planes $2x-2y+z+3=0$ and $4x-4y+2z+5=0$.
9. Obtain equation of plane that bisects the segment joining the points $(1,2,3)$ and $(3,4,5)$ at right angles.

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F.Y.B.Sc. Mathematics (Semester - II)
Subject: Analytical Geometry
Practical 4 : Lines

1. Find the distance of $P(1,2,-3)$ from the plane $2x+y-6z+2=0$ measured parallel to the line $2x=-y=3z$.
2. Show that the line $2x+2y-z-6=0, 2x+3y-z-8=0$ is parallel to the plane $y=0$ and find the coordinates of point where it meets the plane $x=0$.
3. Find the angle between the line $\frac{x-1}{2}=\frac{y-2}{1}=\frac{z-3}{-2}$ and the plane $x+2y+z-3=0$.
4. Show that the line $\frac{x-1}{4}=\frac{y-8}{7}=\frac{z-4}{6}$ lies in the plane x + 2y - 3z = 5.
5. Show that the line $\frac{x+2}{3}=y-1=\frac{z}{-2}$ intersect the line $x-y-z-1=0=2x+y-z-6$ and also find the point of intersection.
6. Find the angle between the lines $x-y-z+1=0=3x+4z$ and $2x+y-z=0=y+3z$.
7. Find the equation of the plane containing the line $\frac{x+1}{-3}=\frac{y-2}{1}=\frac{z+2}{2}$ and a point $(2,3,2)$.
8. Show that the lines $\frac{x-4}{3}=\frac{y-3}{0}=\frac{z-1}{-2}, x-3=-y-8=-z-2$ are coplanar. Find the equation of the plane containing them. Also find the point of intersection.
9. Find the shortest distance between the lines $\frac{x-2}{3}=\frac{y-6}{-2}=\frac{z-5}{-2}$ and $\frac{x-5}{2}=\frac{y-3}{1}=\frac{z+4}{-6}$

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F.Y.B.Sc. Mathematics (Semester - II)
Subject: Analytical Geometry
Practical 5 : Spheres

1. Find the centre and radius of the sphere $x^2+y^2+z^2-6x+4y-2z-2=0$
2. Find the equation of the sphere passing through the points $(0,0,0)$, $(0,1,-1)$, $(-1,2,0)$ and $(1,3,2)$.
3. Find the equation of the sphere passing through the points $(1,1,1)$, $(3,1,2)$, $(-1,0,2)$ and the centre lies on the plane $x+y+z=4$.
4. Find the equation of the smallest sphere passing through $(2,1,1)$ and $(1,3,0)$.
5. Show that the spheres $x^2+y^2+z^2-4x-2y-4z+5=0$ and $x^2+y^2+z^2-6x-6y+17=0$ touch each other and find their point of contact.
6. Find the length of the chord of the sphere $x^2+y^2+z^2-2+3y-5z-31=0$ cut by the line $\frac{x-7}{2}=\frac{y-6}{1}=\frac{z+5}{-1}$.
7. Find the centre and radius of the circle given by $x^2+y^2+z^2-4x+6z-3=0$ and $x+2y-2z=17$.
8. Find the equation of the sphere passing through the circle of intersection of sphere $x^2+y^2+z^2+6x-4y-6z-14=0$ and the plane $x+y-z=0$ and passing through the point $(1,1,-1)$.
9. Show that the plane $6x+2y-3z-28=0$ is the tangent plane to the sphere $x^2+y^2+z^2+6x-2z-39=0$. Find the point of contact.
10. Find the equation of the sphere which passes through the circle $x^2+y^2+z^2-2x-3=0, y+z-2=0$ and touches the plane $x+z-4=0$.