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Geometry 1 (Analytic Geometry)

Exercise Sheet 2

Exercise 1. Give the coordinates of the vertices of the rectangular parallelepiped whose sides are the coordinate planes and the planes $x = 1$, $y = 3$ and $z = 6$.

Exercise 2. Describe the locus of points $P(x, y, z)$ in each of the following situations:

(a) $xyz = 0$;

(b) $x^2 + y^2 + z^2 = 0$;

(c) $(x + 1)^2 + (y - 1)^2 + (z + 3)^2 = 0$;

(d) $(x - 2)(z - 8) = 0$;

(e) $z^2 - 25 = 0$.

Exercise 3. Show that the given points are collinear:

(a) $P_1(1, 2, 9)$, $P_2(-2, -2, -3)$, $P_3(7, 10, 6)$;

(b) $Q_1(2, 3, 2)$, $Q_2(1, 4, 4)$, $Q_3(5, 0, -4)$;

Exercise 4. Find x if:

(a) $P_1(x, 2, 3)$, $P_2(2, 1, 1)$ and $P_1P_2 = \sqrt{21}$;

(b) $Q_1(x, x, 1)$, $Q_2(0, 3, 5)$ and $Q_1Q_2 = 5$.

Exercise 5. The coordinates of the midpoint of the segment $[P_1P_2]$, determined by $P_1(x_1, y_1, z_1)$ and $P_2(2, 3, 6)$ are (-1,-4,8). Find the coordinates of P_1.

Exercise 6. Let P_3 be the midpoint of the segment joining the points $P_1(-3, 4, 1)$ and $P_2(-5, 8, 3)$. Find the coordinates of the midpoint of the segment:

(a) joining P_1 and P_3;

(b) joining P_3 and P_2;

Exercise 7. Graph the point P whose polar coordinates are given by: $(2, \pi)$, $(3, \pi/3)$, $(4, 3\pi/2)$, $(5, \pi/6)$.

Exercise 8. Find the polar equation corresponding to the given Cartesian equation:

(a) $y = 5$;

(b) $y = 7x$;

(c) $y^2 = -4x + 4$

(d) $x^2 + y^2 = 36$;

Exercise 9. Determine, in cylindrical coordinates, the equation of the surface whose equation in rectangular coordinates is $z = x^2 + y^2 - 2x + y$.

Exercise 10. Find the equation, in rectangular coordinates, of the surface whose equation in cylindrical coordinates is $\rho = 4\cos(\theta)$.