PART 2

PAST EXAMINATION QUESTIONS: PARAMETRIC + CARTESION EQNS.

1. A is the point (0, 4) and B is the variable point $(2t, 0)$. The perpendicular bisector of AB meets AB at M and the y-axis at R. Find, in terms of t. the co-ordinates of the midpoint, P, of MR and hence find the equation of the locus of P as t varies. (J74/P1/14)

2. A line through the point (3, 0) meets the variable line $y = tx$ at right angles at the point P. Find, in terms of t, the co-ordinates of P. Find the value of k for which P lies on the curve $x^2 + y^2 = kx$. (N74/P1/14)

3. Find the equation of the straight line having a gradient of $\frac{1}{t}$ and passing through the point $(2t, 0)$. This line meets the line $y = t(x - 2)$ in the point A. Find, in terms of t, the co-ordinates of A. Hence determine the locus of A as t varies. (J75/P2/14)

4. The parametric equations of a curve are $x = 2t(t-1)$, $y = 2 + t$. Find a relation between x and y which is independent of t. (N75/P2/16b)

5. The operation M, defined by $(x, y) \to (x + y, x - y)$, maps the point P on to the point Q. (i) State in the same form the operation which maps Q on to P. (ii) Describe the geometrical transformation represented by M^2. (J76/P2/8)

6. An operation maps $P(x, y)$ on to the poin t $P'(2x - y, y - x)$. Find the locus of P' as P moves along (i) the line $y = x$, (ii) the y-axis, (iii) the x-axis. (J78/P1/10)

7. The line $x + y = t$ meets the line $y = tx$ at the point P. Find the co-ordinates of P in terms of t. Hence, or otherwise, show that the equation of the locus of P as t varies is $x^2 + xy - y = 0$. At the point on the locus where $x = 3$, find the value of y and the value of t. (J78/P2/14)

8. Find the equations of (i) the line through the point $(t, 0)$ with gradient t, (ii) the line through the point $(0, t)$ with gradient $-t$. These two lines intersect at the point P. Find the co-ordinates of P in terms of t, and the cartesian equation of the locus of P as t varies. (N78/P2/14)

9. A point moves so that the sum of its distance from the origin and its distance from the y-axis is 3 units. Show that the equation of its locus is $y^2 = 9 - 6x$. (J79/P1/14a)

10. An operation maps $P(x, y)$ onto the point $P'(x + y, 2x)$. Find the locus of P' as P moves along (i) the line $y = x$, (ii) the line $y = -x$, (iii) the y-axis. (N79/P2/10)

11. A point $P(x, y)$ moves so that $\frac{PA}{PB} = 2$, where A is the point $(-3, 0)$ and B the point $(3, 0)$. Show that the equation of the locus of P is $x^2 + y^2 - 10x + 9 = 0$. (N79/P2/12a)

1. $(\frac{t}{2}, 2-\frac{t^2}{4})$; $y=2-x^2$

2. $(\frac{3}{1+t^2}, \frac{3t}{1+t^2})$; 3

3. $ty=x-2t$, $(\frac{2t}{t+1}, \frac{-2t}{t+1})$, $y=-x$

4. $x=2y^2-10y+12$

5. (i) $(x, y) \to (\frac{x+y}{2}, \frac{x-y}{2})$

   (ii) enlargement, centre the origin, scale factor 2

6. (i) x-axis

   (ii) $y=-x$

   (iii) $y=-\frac{1}{2}x$

7. $(\frac{t}{t+1}, \frac{t^2}{t+1})$, $y=-4\frac{1}{2}$, $t=-1\frac{1}{2}$

8. (i) $y=tx-t^2$

   (ii) $y=t-tx$; $(\frac{t+1}{2}, \frac{t-t^2}{2})$,

   $y=-2x^2+3x-1$

10. (i) $y=x$

   (ii) $x=0$

   (iii) $y=0$