PART 3.

PAST EXAMINATION QUESTIONS : PARAMETRIC + CARTESIAN EQNS.

1. An operation maps $P(x, y)$ onto $P'(x + y, 2y - x)$. Find the equation of the locus of P' as P moves along (i) the x-axis, (ii) the line $y = x$, (iii) the line $y = -x$. (N80/P1/10)

2. Find the equation of the straight line having a gradient of $-\frac{1}{t}$ and passing through the point $\left(t^2, 2t\right)$. This line meets the line $2y + x = 4 + 2t^2$ in the point P. Show that the y-coordinate of P is $t + 2$. Find the x-coordinate of P and determine the equation of the locus of P as t varies. (N80/P2/15)

3. (a) A, B and P are the points (3, 2), (6, 4) and (x, y) respectively. Given that the $\angle APB$ is a right angle find the equation of the locus of P.

   (b) Find the cartesian equation of the curve which are defined parametrically by $x = t(t - 1)$, $y = 1 + t$. (N81/P1/16)

4. An operation maps $P(x, y)$ onto $P'(x - y, 2y)$. Find the equation of the locus of P' as P moves on the line $y = 2x$. (N83/P2/10b)

5. (a) Find the cartesian equation of the curve which is defined parametrically by $x = t - 3$, $y = t^2 - 5t$.

   (b) Find the equation of the line of gradient m that passes through the point (m, m). Given that this line crosses the x-axis at A and the y-axis at B, find the equation of the locus of M, the midpoint of AB, as m varies. (J84/P2/16)

6. The line $y = px$ meets the line $y = x + p$ at Q. Find the equation of the locus of Q as p varies. (N84/P2/16a)

7. Find the cartesian equation of the curve which is defined parametrically by $x = t(t - 1)$, $y = 1 + t$. (Sp2/6bi)

8. (a) The line $py = x + p$ meets the line $y = px$ at Q. Find (i) the equation of the locus of Q as p varies, (ii) the co-ordinates of the points where this locus meets the y-axis.

   (b) Given that A is the point (0, 3) and B is the point (0, –3), a point $P(x, y)$ moves so that $PA = 2\,PB$. Show that the equation of the locus of P is $x^2 + y^2 + 10y + 9 = 0$. (J85/P1/16)

9. A line through the point (1, 0) meets the variable line $y = tx$ at right angles at the point P. Find, in terms of t, the co-ordinates of P. Show that the equation of the locus of P as t varies is $x^2 + y^2 = x$. (N85/P1/16a)

10. (a) The cartesian equation of a curve is $y(y - 2) = x$. Given that x is defined parametrically by $x = t^2 - 1$ and that $y = 4$ when $t = 3$, express y in terms of t.

    (b) The parametric equations of a curve are $x = t^3 - t$, $y = t^2 + t$. Express $\frac{x}{y}$ in terms of t in the simplest possible form. Hence, or otherwise, find the Cartesian equation of the curve. (J86/P2/8b)

1. (i) $x+y=0$
   (ii) $2y=x$
   (iii) $x=0$
2. $ty+x=3t^2,\ 2t^2-2t,\ x=2y^2-10y+12$
3. (a) $x^2+y^2-9x-6y+26=0$
   (b) $y^2=x+3y-2$
4. $y=-4x$
5. (a) $y=(x+3)(x-2)$
   (b) $y-mx=m-m^2,\ y=-x(2x+1)$
6. $y=x(y-x)$
7. $x=y^2-3y+2$
8. (a) (i) $x^2=y^2-y$
   (ii) $(0, 0), (0, 1)$
9. $\left(\frac{1}{1+t^2}, \frac{t}{1+t^2}\right)$
10. (a) $y=t+1$
   (b) $\frac{x}{y}=t-1;\ y^3=x^2+3xy+2y^2$