

1

The line $y = 3x + k$ is a tangent to the curve $x^2 + xy + 16 = 0$.

(i) Find the possible values of k . [3]

(ii) For each of these values of k , find the coordinates of the point of contact of the tangent with the curve. [2]

2

Find the coordinates of the points where the straight line $y = 2x - 3$ intersects the curve $x^2 + y^2 + xy + x = 30$. [5]

3

Find the values of m for which the line $y = mx - 9$ is a tangent to the curve $x^2 = 4y$. [4]

4

The line $2y = 3x - 6$ intersects the curve $xy = 12$ at the points P and Q . Find the equation of the perpendicular bisector of PQ . [8]

5

Find the values of k for which the line $x + 3y = k$ and the curve $y^2 = 2x + 3$ do not intersect. [4]

6

The line $4y = x + 11$ intersects the curve $y^2 = 2x + 7$ at the points A and B . Find the coordinates of the mid-point of the line AB . [4]

7

Without using a calculator, solve, for x and y , the simultaneous equations

$$\begin{aligned} 8^x + 2^y &= 64, \\ 3^{4x} \times \left(\frac{1}{9}\right)^{y-1} &= 81. \end{aligned} \quad [5]$$

8

Find the values of k for which the line $y = x + 2$ meets the curve $y^2 + (x + k)^2 = 2$. [5]