1. Consider the curve with equation $x^2 + xy + y^2 = 3$.

    (a) Find in terms of k, the gradient of the curve at the point $(-1, k)$.

          (5)

    (b) Given that the tangent to the curve is parallel to the x-axis at this point, find the value of k.

          (1)
          (Total 6 marks)

2. A curve C is defined implicitly by $xe^y = x^2 + y^2$. Find the equation of the tangent to C at the point $(1, 0)$.

          (Total 7 marks)

3. Find the gradient of the tangent to the curve $x^3 y^2 = \cos(\pi y)$ at the point $(-1, 1)$.

          (Total 6 marks)

4. Find the equation of the normal to the curve $x^3 y^3 - xy = 0$ at the point $(1, 1)$.

          (Total 7 marks)

5. Find the gradient of the normal to the curve $3x^2y + 2xy^2 = 2$ at the point $(1, -2)$.

(Total 6 marks)

6. Find the equation of the normal to the curve $5xy^2 - 2x^2 = 18$ at the point $(1, 2)$.

(Total 7 marks)

7. Show that the points $(0, 0)$ and $(\sqrt{2\pi}, -\sqrt{2\pi})$ on the curve $e^{(x+y)} = \cos(xy)$ have a common tangent.

(Total 7 marks)

8. Find the gradient of the curve $e^{xy} + \ln(y^2) + e^y = 1 + e$ at the point $(0, 1)$.

(Total 7 marks)