1 A curve has implicit equation $y^2 + 2x\ln y = x^2$.

Verify that the point (1, 1) lies on the curve, and find the gradient of the curve at this point. **[6]**

2 A curve has equation $x^2 + 2y^2 = 4x$.

(i) By differentiating implicitly, find $\frac{dy}{dx}$ in terms of x and y. **[3]**

(ii) Hence find the exact coordinates of the stationary points of the curve. [You need not determine their nature.] **[3]**

3 Given that $y = \ln\left(\sqrt{\frac{2x-1}{2x+1}}\right)$, show that $\frac{dy}{dx} = \frac{1}{2x-1} - \frac{1}{2x+1}$. **[4]**

4 Fig. 7 shows the curve $x^3 + y^3 = 3xy$. The point P is a turning point of the curve.

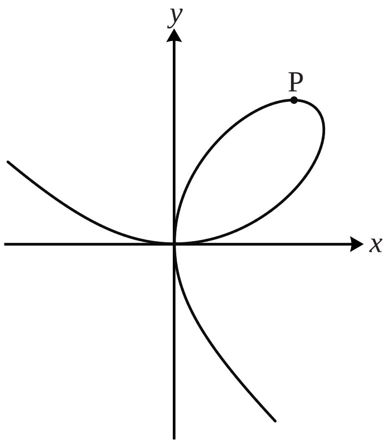

Fig. 7

(i) Show that $\frac{dy}{dx} = \frac{y - x^2}{y^2 - x}$. **[4]**

(ii) Hence find the exact x-coordinate of P. **[4]**

5 Find the gradient at the point (0, ln 2) on the curve with equation $e^{2y} = 5 - e^{-x}$. **[4]**

6 A curve is defined by the equation $(x + y)^2 = 4x$. The point (1, 1) lies on this curve.

By differentiating implicitly, show that $\frac{dy}{dx} = \frac{2}{x + y} - 1$.

Hence verify that the curve has a stationary point at (1, 1). **[4]**

7 A curve is defined by the equation $\sin 2x + \cos y = \sqrt{3}$.

(i) Verify that the point P $\left(\frac{1}{6}\pi, \frac{1}{6}\pi\right)$ lies on the curve. **[1]**

(ii) Find $\frac{dy}{dx}$ in terms of x and y.

Hence find the gradient of the curve at the point P. **[5]**

8 **(i)** Given that $y = \sqrt[3]{1 + 3x^2}$, use the chain rule to find $\frac{dy}{dx}$ in terms of x. **[3]**

(ii) Given that $y^3 = 1 + 3x^2$, use implicit differentiation to find $\frac{dy}{dx}$ in terms of x and y. Show that this result is equivalent to the result in part **(i)**. **[4]**