Implicit Differentiation - Edexcel Past Exam Questions

1. A curve has equation

$$x^2 + 2xy - 3y^2 + 16 = 0.$$

Find the coordinates of the points on the curve where $\frac{dy}{dx} = 0$. **(7)**

June 05 Q2

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2. A curve C is described by the equation

$$3x^2 + 4y^2 - 2x + 6xy - 5 = 0.$$

Find an equation of the tangent to C at the point $(1, -2)$, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. **(7)**

Jan 06 Q1

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3. A curve C is described by the equation

$$3x^2 - 2y^2 + 2x - 3y + 5 = 0.$$

Find an equation of the normal to C at the point $(0, 1)$, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. **(7)**

June 06 Q1

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4. A set of curves is given by the equation $\sin x + \cos y = 0.5$.

(a) Use implicit differentiation to find an expression for $\frac{dy}{dx}$. **(2)**

For $-\pi < x < \pi$ and $-\pi < y < \pi$,

(b) find the coordinates of the points where $\frac{dy}{dx} = 0$. **(5)**

Jan 07 Q5

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5. (a) Given that $y = 2^x$, and using the result $2^x = e^{x \ln 2}$, or otherwise, show that $\frac{dy}{dx} = 2^x \ln 2$. **(2)**

(b) Find the gradient of the curve with equation $y = 2^{(x^2)}$ at the point with coordinates $(2, 16)$. **(4)**

Jan 07 Q6

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6. A curve is described by the equation

$$x^3 - 4y^2 = 12xy.$$

(*a*) Find the coordinates of the two points on the curve where $x = -8$. **(3)**

(*b*) Find the gradient of the curve at each of these points. **(6)**

Jan 08 Q5

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7. A curve has equation $3x^2 - y^2 + xy = 4$. The points P and Q lie on the curve. The gradient of the tangent to the curve is $\frac{8}{3}$ at P and at Q.

(*a*) Use implicit differentiation to show that $y - 2x = 0$ at P and at Q. **(6)**

(*b*) Find the coordinates of P and Q. **(3)**

June 08 Q4

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8. A curve C has the equation $y^2 - 3y = x^3 + 8$.

(*a*) Find $\frac{dy}{dx}$ in terms of x and y. **(4)**

(*b*) Hence find the gradient of C at the point where $y = 3$. **(3)**

Jan 09 Q1

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9. The curve C has the equation $ye^{-2x} = 2x + y^2$.

(*a*) Find $\frac{dy}{dx}$ in terms of x and y. **(5)**

The point P on C has coordinates (0, 1).

(*b*) Find the equation of the normal to C at P, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. **(4)**

June 09 Q4

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10. The curve C has equation

$$\cos 2x + \cos 3y = 1, \quad -\frac{\pi}{4} \leq x \leq \frac{\pi}{4}, \quad 0 \leq y \leq \frac{\pi}{6}.$$

(*a*) Find $\frac{dy}{dx}$ in terms of x and y. **(3)**

The point P lies on C where $x = \frac{\pi}{6}$.

(*b*) Find the value of y at P. **(3)**

(*c*) Find the equation of the tangent to C at P, giving your answer in the form $ax + by + c\pi = 0$, where a, b and c are integers. **(3)**

Jan 10 Q3

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11. A curve C has equation

$$2^x + y^2 = 2xy.$$

Find the exact value of $\frac{dy}{dx}$ at the point on C with coordinates (3, 2). **(7)**

June 10 Q3

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12. Find the gradient of the curve with equation

$$\ln y = 2x \ln x, \qquad x > 0, \quad y > 0,$$

at the point on the curve where $x = 2$. Give your answer as an exact value. **(7)**

June 11 Q5
