A2 Implicit Differentiation - Past Edexcel Exam Questions

1. **(Question 2 - C4 June 2018)**

2. The curve C has equation

$$x^2 + xy + y^2 - 4x - 5y + 1 = 0$$

(a) Use implicit differentiation to find $\frac{dy}{dx}$ in terms of x and y.

(5)

(b) Find the x coordinates of the two points on C where $\frac{dy}{dx} = 0$

Give exact answers in their simplest form.
(*Solutions based entirely on graphical or numerical methods are not acceptable.*)

(5)

2. **(Question 4 - C4 June 2017)**

4. The curve C has equation

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

The point P with coordinates $(-2, 4)$ lies on C.

(a) Find the exact value of $\frac{dy}{dx}$ at the point P.

(6)

The normal to C at P meets the y-axis at the point A.

(b) Find the y coordinate of A, giving your answer in the form $p + q\ln 2$, where p and q are constants to be determined.

(3)

3. **(Question 3 - C4 June 2016)**

3. The curve C has equation

$$2x^2y + 2x + 4y - \cos(\pi y) = 17$$

(a) Use implicit differentiation to find $\frac{dy}{dx}$ in terms of x and y.

(5)

The point P with coordinates $\left(3, \frac{1}{2}\right)$ lies on C.

The normal to C at P meets the x-axis at the point A.

(b) Find the x coordinate of A, giving your answer in the form $\frac{a\pi + b}{c\pi + d}$, where a, b, c and d are integers to be determined.

(4)

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4. **(Question 2 - C4 June 2015)**

2. The curve C has equation

$$x^2 - 3xy - 4y^2 + 64 = 0$$

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

(5)

(b) Find the coordinates of the points on C where $\frac{dy}{dx} = 0$

(*Solutions based entirely on graphical or numerical methods are not acceptable.*)

(6)

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5. **(Question 1 - C4 June 2014)**

1. A curve C has the equation

$$x^3 + 2xy - x - y^3 - 20 = 0$$

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

(5)

(b) Find an equation of the tangent to C at the point $(3, -2)$, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers.

(2)

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6. **(Question 7 - C4 June 2013)**

7. A curve is described by the equation

$$x^2 + 4xy + y^2 + 27 = 0$$

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

(5)

A point Q lies on the curve.

The tangent to the curve at Q is parallel to the y-axis.

Given that the x coordinate of Q is negative,

(b) use your answer to part (a) to find the coordinates of Q.

(7)

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7. **(Question 5 - C4 June 2012)**

5. The curve C has equation

$$16y^3 + 9x^2y - 54x = 0$$

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

(5)

(b) Find the coordinates of the points on C where $\frac{dy}{dx} = 0$.

(7)

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8. **(Question 5 - C4 June 2011)**

5. Find the gradient of the curve with equation

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

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

(7)

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9. **(Question 3 - C4 June 2010)**

3. 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)

Solutions

1. (a) $\frac{dy}{dx} = \frac{4-2x-y}{x+2y-5}$
   (b) $x = 1 \pm \sqrt{2}$
2. (a) $\frac{dy}{dx} = \frac{4}{\ln(4)-5}$
   (b) $p = \frac{13}{2}$, $q = -1$
3. (a) $\frac{dy}{dx} = -\frac{4xy+2}{2x^2+4+\pi\sin(\pi y)}$
   (b) $x = \frac{3\pi+62}{\pi+22}$ so $a = 3$, $b = 62$, $c = 1$ and $d = 22$
4. (a) $\frac{dy}{dx} = \frac{2x-3y}{3x+8y}$
   (b) $x = \pm\frac{24}{5}$, $y = \pm\frac{16}{5}$
5. (a) $\frac{dy}{dx} = \frac{1-3x^2-2y}{2x-3y^2}$
   (b) $11x - 3y - 39 = 0$
6. (a) $\frac{dy}{dx} = -\frac{2x+4y}{4x+2y}$
   (b) $Q(-3, 6)$
7. (a) $\frac{dy}{dx} = \frac{18-6xy}{16y^2+3x^2}$
   (b) $x = \pm 2$, $y = \pm\frac{3}{2}$
8. $\frac{dy}{dx} = 16\,(\ln(4) + 2)$
9. $\frac{dy}{dx} = 4\ln(2) - 2$