

## Lesson 10

### A-Level Pure Mathematics : Year 2 Differentiation IV

#### 10.1 Mr Clever Sits An Exam

Exam questions on Implicit Differentiation often feature exponential, logarithmic or trigonometric functions. So, get some coffee in your Mr Clever cup, and give these questions a go !

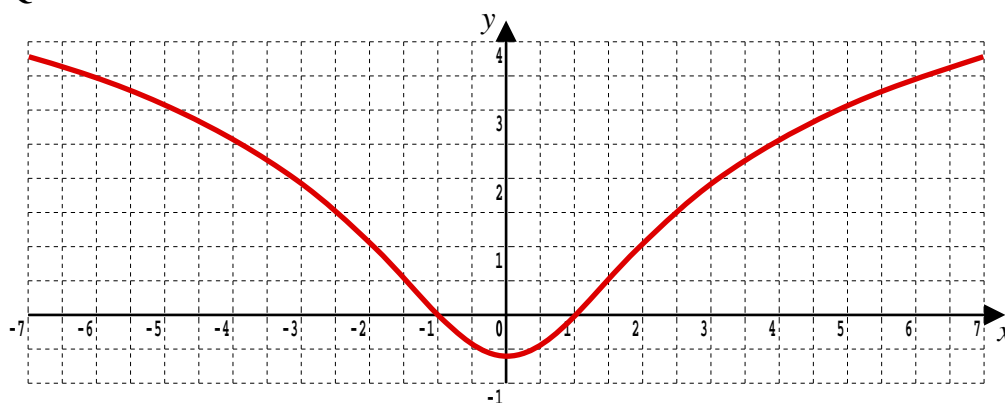


#### 10.2 Exercise

*Any solution based entirely on graphical  
or numerical methods is not acceptable*

Marks Available : 40

##### Question 1



The graph is of the equation  $e^y + y = x^2$

Find the equation of the normal at  $(1, 0)$  in the form  $y = mx + c$  and, having found it, draw the normal onto the graph.

[ 8 marks ]

**Question 2**

*A-Level Examination Question from June 2009, Paper C4, Q4 (Edexcel)*

The curve  $C$  has the equation

$$y e^{-2x} = 2x + y^2$$

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

[ 5 marks ]

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 marks ]

**Question 3**

*A-Level Examination Question from June 2011, Paper C4, Q5 (Edexcel)*

Find the gradient of the curve with equation

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

at the point on the curve where  $x = 2$

Give your answer as an exact value

[ 7 marks ]

**Question 4**

*A-Level Examination Question from January 2010, Paper C4, Q3 (Edexcel)*

The curve  $C$  has the equation

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

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

[ 3 marks ]

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

- ( b ) Find the value of  $y$  at  $P$

[ 3 marks ]

- ( 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 marks ]

**Question 5**

*A-Level Examination Question from January 2007, Paper C4, Q5 (Edexcel)*

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 marks ]

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

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

[ 5 marks ]

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Teachers may obtain detailed worked solutions to the exercises by email from MHHShrewsbury@Gmail.com