

**AQA, Edexcel, OCR, MEI**

**A Level**

# **A Level Mathematics**

## **C3 Differentiation**

Name:

**M M E**

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**Total Marks: /48**

1. Differentiate the following functions by using the product rule:

(a)  $y = x^2$ . [1]

(b)  $y = x \sin x$ . [2]

(c)  $y = x^2 \cos x$ . [2]

(d)  $y = \sin x \cos x$ . [2]

(e)  $xe^x \sin x$ . [3]

2. Differentiate the following functions by using the quotient rule:

(a)  $y = \frac{x^2}{x-1}$ . [2]

(b)  $y = \frac{e^x}{x}$ . [2]

(c)  $y = \tan x$ . (*you may wish to use the fact that  $\tan x = \frac{\sin x}{\cos x}$* ) [3]

3. Differentiate the following functions by using the chain rule:

(a)  $y = \sin(2x)$ . [2]

(b)  $y = (x + 1)^2$ . [2]

(c)  $y = 2e^{x^2}$ . [2]

(d)  $y = \sin(e^{x^2})$ . [2]

(e)  $y = e^{\sin(2x)}$ . [2]

4. Differentiate the following functions:

(a)  $y = \ln x$ . [1]

(b)  $y = \ln(x^2)$ . [2]

(c)  $y = x^3 e^{2x}$ . [3]

5. Differentiate the following functions implicitly:

(a)  $2y = x^3$ . [2]

(b)  $y^2 = x^2 + 1$ . [2]

(c)  $y^2 = x \sin(2x)$ . [3]

(d)  $4y^2 + 2x^2 = 1$ . [2]

6. *Challenge:* Differentiate  $y = \arcsin x$ . [6]