#### **MEI AS Mathematics Differentiation**



[2]

#### **Topic Assessment**

- 1. Given that  $y = \frac{1}{2\sqrt{x}}$ , write down  $\frac{dy}{dx}$ . [2]
- A curve has equation y = x<sup>3</sup> + 4x<sup>2</sup> 3x + 1.
  - (a) Sketch the gradient function for the curve. [3]
  - (b) State the range of values of x for which x³ + 4x² 3x+1 is decreasing.
- 3. Show that the only stationary point on the curve  $y = 2x^2 \sqrt{x}$  is a minimum point. [4]
- A curve has equation y = 2x<sup>3</sup> 3x<sup>2</sup> 8x + 9.
   Find the equations of the two tangents to the curve which have gradient 4.
- 5. (a) Find the equation of the normal to the graph  $y = x \frac{2}{x^2}$  at the point where x = 1.[3]
  - (b) Show that the normal does not meet the curve again. [5]
- 6 Sabah is using a spreadsheet to investigate the gradient of the curve y = x\*. She uses the spreadsheet to calculate the gradient of the chord from the point where x = 2 to the point where x = 2 + h for different values of h. Part of her spreadsheet is shown below.

.edl	A	6	C	D	E	- F
7	(40)	h(x)	h	oc+h	f(x+h)	Gradient
2	2	1.5	1	3	81	65
3	2	1.5	0.1	2.1		34.481
4	2	1.6	0.01	2.01	16.32240601	
5	2	1,5	0.001		16.00202401	32.024006
6-	2	1.5	0.0001	2.0001	16.00320024	32.00240008

- (a) Fill in the missing values in cells D5, E3 and F4. [4]
- (b) Use differentiation from first principles to show that the gradient of the curve y = x<sup>4</sup> at the point where x = 2 is 32.
  [3]
- 7. In this question you must show detailed reasoning.

Find the stationary points of the graph  $y = \frac{1}{x} + \frac{1}{x^2} - \frac{1}{x^3}$ . Determine the nature of each.

- Two real numbers x and y are such that kx + y = 100, where k is a positive constant. Find, in terms of k, the maximum value of the product of the two numbers.
- A cuboid has a square base of length x cm and height y cm. The surface area of the cuboid is 24 cm<sup>2</sup>.
  - (a) Show that  $V = 6x 0.5x^3$ . [3]
  - (b) Show that the maximum volume of the cuboid occurs when x = 2, and find this maximum volume. [4]

Total 50 marks

[7]



# Ocr Mei Cjune 2013 Exam Paper

**Kathleen Armour** 

Ocr Mei Cjune 2013 Exam Paper:

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