

## **AS Level Mathematics A**

**H230/01** Pure Mathematics and Statistics

### **Question Set 5**

1 (a) Find  $\frac{d}{dx}\left(x^3 - 3x + \frac{5}{x^2}\right)$ . [3]

(b) Find  $\int\left(6x^2 - \frac{2}{x^3}\right)dx$ . [3]

2 Points  $A$  and  $B$  have position vectors  $\begin{pmatrix} -3 \\ 4 \end{pmatrix}$  and  $\begin{pmatrix} 1 \\ 2 \end{pmatrix}$  respectively.

Point  $C$  has position vector  $\begin{pmatrix} p \\ 1 \end{pmatrix}$  and  $ABC$  is a straight line.

(a) Find  $p$ . [2]

Point  $D$  has position vector  $\begin{pmatrix} q \\ 1 \end{pmatrix}$  and angle  $ABD = 90^\circ$ .

(b) Determine the value of  $q$ . [3]

3 **In this question you must show detailed reasoning.**

(a) Solve the equation  $4\sin^2\theta = \tan^2\theta$  for  $0^\circ \leq \theta \leq 180^\circ$ . [5]

(b) Prove that  $\frac{\sin^2\theta - 1 + \cos\theta}{1 - \cos\theta} \equiv \cos\theta$  ( $\cos\theta \neq 1$ ). [3]

4 (a) Expand  $(1+x)^4$ . [1]

(b) **Use your expansion** to determine the exact value of  $1002^4$ . [4]

5 The function  $f$  is defined by  $f(x) = (x+a)(x+3a)(x-b)$  where  $a$  and  $b$  are positive integers.

(a) On the axes in the Printed Answer Booklet, sketch the curve  $y = f(x)$ . [2]

(b) On your sketch show, in terms of  $a$  and  $b$ , the coordinates of the points where the curve meets the axes. [2]

It is now given that  $a = 1$  and  $b = 4$ .

(c) Find the total area enclosed between the curve  $y = f(x)$  and the  $x$ -axis. [4]

6 **In this question you must show detailed reasoning.**

(a) Solve the inequality  $x^2 + x - 6 > 0$ , giving your answer in set notation. [4]

(b) Solve the equation  $x^3 - 7x^{\frac{3}{2}} - 8 = 0$ . [4]

(c) Find the exact solution of the equation  $(3^x)^2 = 3 \times 2^x$ . [5]

- 7 Determine the points of intersection of the curve  $3xy + x^2 + 14 = 0$  and the line  $x + 2y = 4$ . [5]

**Total Marks for Question Set 5: 50**

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