OCR
Oxford Cambridge and RSA

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 $ABD = 90°$.

(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 $0° \leqslant \theta \leqslant 180°$. [5]

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

$y=-\frac{x}{2}+2$

$3x(-\frac{x}{2}+2)+x^2+14=0$

$-\frac{3x^2}{2}+6x+x^2+14=0$

$-3x^2+12x+2x^2+28=0$

$x^2-12x-28=0$ $x=-2\ y=3\ (-2,3)$

$(x+2)(x-14)$ $x=14\ y=-5\ (14,-5)$

Total Marks for Question Set 5: 50