AS Level Mathematics A

H230/01 Pure Mathematics and Statistics

Question Set 5

1

    (a) Find $\dfrac{\mathrm{d}}{\mathrm{d}x}\left(x^3 - 3x + \dfrac{5}{x^2}\right)$.   **[3]**

    (b) Find $\displaystyle\int\left(6x^2 - \dfrac{2}{x^3}\right)\mathrm{d}x$.   **[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 $\dfrac{\sin^2\theta - 1 + \cos\theta}{1 - \cos\theta} \equiv \cos\theta \quad (\cos\theta \neq 1)$.   **[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]**

Total Marks for Question Set 5: 50