OCR
Oxford Cambridge and RSA

AS Level Mathematics A

H230/01 Pure Mathematics and Statistics

Question Set 1

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

(i) Express $3^{\frac{7}{2}}$ in the form $a\sqrt{b}$, where a is an integer and b is a prime number. **[2]**

(ii) Express $\dfrac{\sqrt{2}}{1-\sqrt{2}}$ in the form $c+d\sqrt{e}$, where c and d are integers and e is a prime number. **[3]**

2 **(i)** The equation $x^2+3x+k=0$ has repeated roots. Find the value of the constant k. **[2]**

(ii) Solve the inequality $6+x-x^2>0$. **[2]**

3 **(i)** Solve the equation $\sin^2\theta = 0.25$ for $0^\circ \leqslant \theta < 360^\circ$. **[3]**

(ii) **In this question you must show detailed reasoning.**

Solve the equation $\tan 3\phi = \sqrt{3}$ for $0^\circ \leqslant \phi < 90^\circ$. **[3]**

4 **(i)** It is given that $y = x^2+3x$.

(a) Find $\dfrac{dy}{dx}$. **[2]**

(b) Find the values of x for which y is increasing. **[2]**

(ii) Find $\int (3-4\sqrt{x})\,dx$. **[5]**

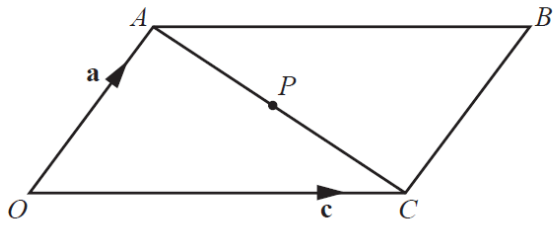
5 N is an integer that is not divisible by 3. Prove that N^2 is of the form $3p+1$, where p is an integer. **[5]**

6 Sketch the following curves.

(i) $y = \dfrac{2}{x}$ **[2]**

(ii) $y = x^3-6x^2+9x$ **[5]**

7 $OABC$ is a parallelogram with $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$. P is the midpoint of AC.



(i) Find the following in terms of **a** and **c**, simplifying your answers.

(a) $\overrightarrow{AC}$ **[1]**

(b) $\overrightarrow{OP}$ **[2]**

(ii) Hence prove that the diagonals of a parallelogram bisect one another. **[4]**

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

The lines $y = \frac{1}{2}x$ and $y = -\frac{1}{2}x$ are tangents to a circle at (2, 1) and (−2, 1) respectively. Find the equation of the circle in the form $x^2 + y^2 + ax + by + c = 0$, where a, b and c are constants. **[6]**

Total Marks for Question Set 1: 49