Surname	
Other Names	
Candidate Signature	

Centre Number						Candidate Number				

Examiner Comments	

Total Marks

MATHEMATICS

AS PAPER 1

CM

Bronze Set A (Edexcel Version)

Time allowed: 2 hours

Instructions to candidates:

• In the boxes above, write your centre number, candidate number, your surname, other names and signature.

• Answer ALL of the questions.

• You must write your answer for each question in the spaces provided.

• You may use a calculator.

Information to candidates:

• Full marks may only be obtained for answers to ALL of the questions.

• The marks for individual questions and parts of the questions are shown in round brackets.

• There are 13 questions in this question paper. The total mark for this paper is 100.

Advice to candidates:

• You should ensure your answers to parts of the question are clearly labelled.

• You should show sufficient working to make your workings clear to the Examiner.

• Answers without working may not gain full credit.

1 0 3 3 1 2 1 1 8 0 0 0 4

1 (a) Find

$$\int (2x^2 - 5\sqrt{x} + 1)\,dx$$

giving each term in its simplest form. **(4)**

(b) Evaluate

$$\int_0^1 (2x^2 - 5\sqrt{x} + 1)\,dx$$

(2)

Question 1 continued

TOTAL 6 MARKS

2 Solve the simultaneous equations

$$x^2 + 4y^2 = 1$$
$$2y = x + 1$$

(4)

Question 2 continued

TOTAL 4 MARKS

3 **Figure 1** below shows the graph with equation $y = f(x)$.

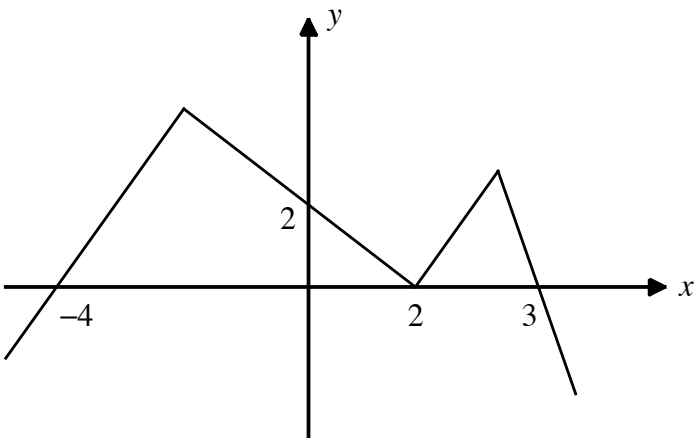

Figure 1

On separate axes, sketch the graphs with equation

(a) $y = f(x - 4)$ **(3)**

(b) $y = -2f(x)$ **(3)**

On each sketch, show clearly the coordinates of any points where the graph crosses or meets the coordinate axes.

Question 3 continued

TOTAL 6 MARKS

4 The line l_1 has the equation $kx + (1 - k)y = 5$.

(a) Find, in terms of k, an expression for the gradient of the line l_1. **(2)**

The line l_2 passes through the points $(1, 4)$ and $(3, k)$.

(b) Find, in terms of k, an expression for the gradient of the line l_2. **(1)**

Given that l_1 and l_2 are perpendicular,

(c) (i) show that $k^2 - 2k - 2 = 0$. **(3)**

(ii) Hence, find the exact possible values of k. **(1)**

Question 4 continued

TOTAL 7 MARKS

5 The function f is defined such that

$$f(x) = 3x^3 + ax^2 - x - 2$$

Given that $(x + 1)$ is a factor of $f(x)$,

(a) find the value of the constant a. **(2)**

(b) Solve the equation $f(x) = 0$. **(3)**

(c) Sketch the curve with equation $y = f(x)$. **(3)**

On your sketch, show clearly the coordinates of any points where the curve crosses or meets the coordinate axes.

Question 5 continued

TOTAL 8 MARKS

6 The price of a car, P pounds, at time t years after being released is modelled by the equation

$$P = 14500\,e^{-0.37t} + 1500$$

(a) Show that the initial price of the car is £16000. **(1)**

(b) Find the time taken for the price of the car to drop to 50% of its initial value. **(4)**

(c) Write down the limiting value for the price of the car. **(1)**

Question 6 continued

TOTAL 6 MARKS

7 The circle C has the equation $x^2 + 2x - y^2 + 3y = 4 - 2y^2$.

(a) Express the equation of the circle C in the form

$$(x - a)^2 + (y - b)^2 = k$$

where a, b and k are constants to be found. **(2)**

(b) Hence, write down the coordinates of the centre of the circle C. **(1)**

(c) Verify that the point $P(0, 1)$ lies on the circle C. **(1)**

(d) Find the equation of the normal to C at P. **(3)**

The normal to C at P intersects the circle again the point Q.

(e) Write down the exact distance between the points P and Q. **(1)**

Question 7 continued

Question 7 continued

Question 7 continued

TOTAL 8 MARKS

8 (a) Prove that the function $f(x) = 3x^2 - 3x + 4$ is always positive. **(2)**

Mark claims that: $2^n + 1 = 2^n + 2^n$.

(b) Is Mark's claim always true, sometimes true or never true? Justify your answer. **(3)**

Question 8 continued

TOTAL 5 MARKS

9 (a) Given that

$$\sqrt{2^{x+y}} = \frac{1}{8^{y+1}}$$

find an expression for x in terms of y. **(3)**

(b) Given that

$$\frac{p+2\sqrt{3}}{\sqrt{3}-1} + \frac{p}{2\sqrt{3}} = q + 5\sqrt{3}$$

find the values of p and q. **(7)**

Question 9 continued

TOTAL 10 MARKS

10 (a) In ascending powers of x, find the first three terms of the binomial expansion of

$$\left(3-\frac{x}{5}\right)^8$$

giving each term in its simplest form. **(4)**

$$g(x)=(ax+b)\left(3-\frac{x}{5}\right)^8$$

Given that the binomial expansion of g(x) contains the terms 32805 and $-4374x$,

(b) find the values of a and b. **(4)**

Question 10 continued

Question 10 continued

Question 10 continued

TOTAL 8 MARKS

11 (i)

$$y = 2x^2 - 4x - x^2\sqrt{x}, \quad x > 0$$

(a) Find $\dfrac{dy}{dx}$. **(3)**

(b) Find the value of k such that

$$\frac{d^2y}{dx^2} + k\sqrt{x} = 4$$

(3)

(ii) The curve C has the equation $y = 3x^3 - 2x^2$.

Find the equation of the normal to C at $x = -1$.

Give your answer in the form $ax + by + c = 0$, where a, b and c are integers. **(5)**

Question 11 continued

Question 11 continued

Question 11 continued

TOTAL 11 MARKS

12 (a) Prove that

$$\frac{\tan^2 x - 1}{\tan^2 x + 1} \equiv 1 - 2\cos^2 x$$

(3)

(b) Hence, show that the equation

$$3\sin^2 \theta - \frac{\tan^2 \theta - 1}{\tan^2 \theta + 1} = 1$$

can be written in the form $\cos^2\theta = k$, where k is a constant to be found. **(3)**

(c) Solve, for $0 \leq \theta \leq 120^\circ$, the equation

$$3\sin^2(3\theta) - \frac{\tan^2(3\theta) - 1}{\tan^2(3\theta) + 1} = 1$$

(2)

Question 12 continued

Question 12 continued

Question 12 continued

TOTAL 8 MARKS

13

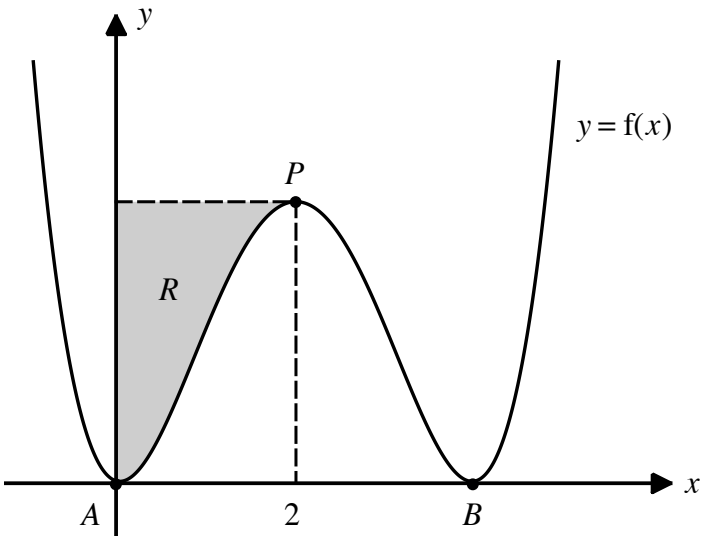

Figure 2

Figure 2 shows a sketch of the curve C with equation $y = \mathrm{f}(x)$, where

$$\mathrm{f}(x) = \frac{1}{4}x^2(4-x)^2$$

The curve C crosses the x-axis at the points A and B.

(a) Write down the coordinates of the points A and B. **(1)**

(b) Expand and simplify the expression for $\mathrm{f}(x)$. **(2)**

The curve C has three stationary points.

The point P is a maximum point on C.

(c) (i) Use calculus to show that the curve has a stationary point at $x = 2$. **(2)**

(ii) Use further calculus to justify that the stationary point at $x = 2$ is the point P. **(3)**

The region R, shown shaded in Figure 2, is bounded by the curve, the y-axis, the lines $x = 2$ and the horizontal line passing through the point P.

(d) Find the exact area of the shaded region R . **(5)**

Question 13 continued

Question 13 continued

Question 13 continued

END OF PAPER **TOTAL 13 MARKS**

TOTAL FOR PAPER IS 100 MARKS