Gold Level G4

Question paper

Level	A Level
Exam Board	Edexcel GCE
Subject	Mathematics
Module	Core 1
Difficulty Level	Gold Level G4
Booklet	Question paper

Time Allowed: **90 minutes**

Score: **/75**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E
>60	52	43	34	25	<16

1. (*a*) Find the value of $16^{-\frac{1}{4}}$.

(2)

(*b*) Simplify $x\left(2x^{-\frac{1}{4}}\right)^4$.

(2)

January 2011

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2. Given that $32\sqrt{2} = 2^a$, find the value of a.

(3)

June 2009

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3. Show that $\dfrac{2}{\sqrt{12} - \sqrt{8}}$ can be written in the form $\sqrt{a} + \sqrt{b}$, where a and b are integers.

(5)

May 2012

4.

$$\frac{dy}{dx} = 5x^{-\frac{1}{2}} + x\sqrt{x}, \qquad x > 0.$$

Given that $y = 35$ at $x = 4$, find y in terms of x, giving each term in its simplest form.

(7)

January 2010

5.

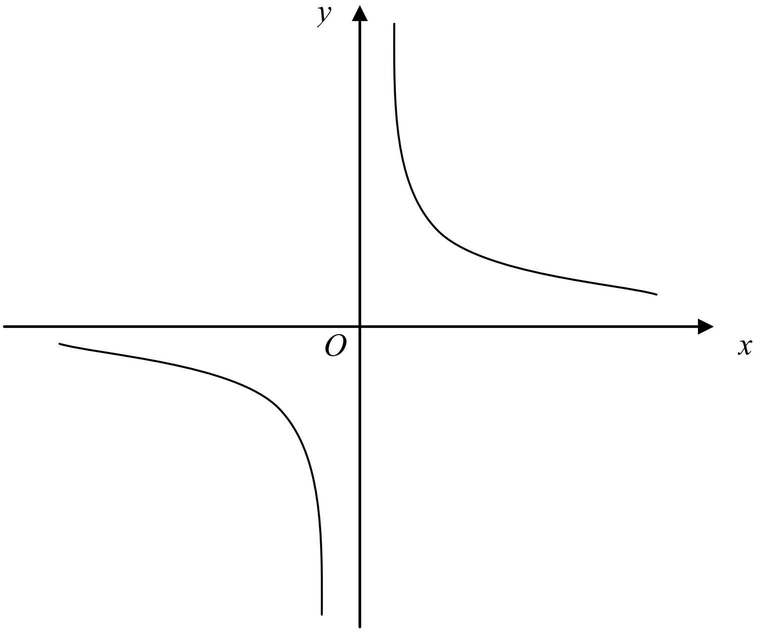

Figure 1

Figure 1 shows a sketch of the curve with equation $y = \frac{3}{x}, \quad x \neq 0$.

(a) On a separate diagram, sketch the curve with equation $y = \frac{3}{x+2}, \quad x \neq -2$, showing the coordinates of any point at which the curve crosses a coordinate axis.

(3)

(b) Write down the equations of the asymptotes of the curve in part (a).

(2)

May 2007

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6. The equation $x^2 + 3px + p = 0$, where p is a non-zero constant, has equal roots.

Find the value of p.

(4)

June 2009

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7. $$f(x) = x^2 + (k + 3)x + k,$$

where k is a real constant.

(*a*) Find the discriminant of $f(x)$ in terms of k.

(2)

(*b*) Show that the discriminant of $f(x)$ can be expressed in the form $(k + a)^2 + b$, where a and b are integers to be found.

(2)

(*c*) Show that, for all values of k, the equation $f(x) = 0$ has real roots.

(2)

May 2011

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8. $$4x - 5 - x^2 = q - (x + p)^2,$$

where p and q are integers.

(*a*) Find the value of p and the value of q.

(3)

(*b*) Calculate the discriminant of $4x - 5 - x^2$.

(2)

(*c*) Sketch the curve with equation $y = 4x - 5 - x^2$, showing clearly the coordinates of any points where the curve crosses the coordinate axes.

(3)

May 2012

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9. The first term of an arithmetic series is a and the common difference is d.

The 18th term of the series is 25 and the 21st term of the series is $32\frac{1}{2}$.

(*a*) Use this information to write down two equations for a and d.

(2)

(*b*) Show that $a = -17.5$ and find the value of d.

(2)

The sum of the first n terms of the series is 2750.

(*c*) Show that n is given by

$$n^2 - 15n = 55 \times 40.$$

(4)

(*d*) Hence find the value of n.

(3)

January 2009

10.

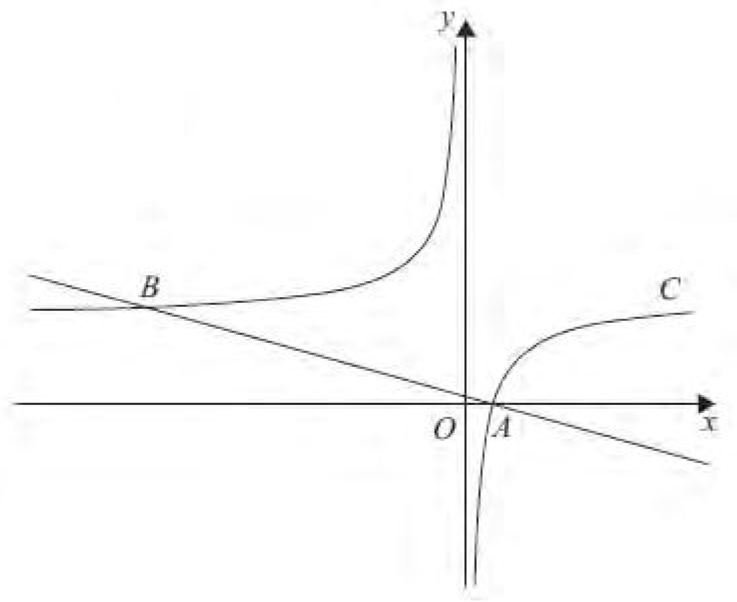

Figure 2

Figure 2 shows a sketch of the curve C with equation

$$y = 2 - \frac{1}{x}, \qquad x \neq 0.$$

The curve crosses the x-axis at the point A.

(a) Find the coordinates of A.

(1)

(b) Show that the equation of the normal to C at A can be written as

$$2x + 8y - 1 = 0.$$

(6)

The normal to C at A meets C again at the point B, as shown in Figure 2.

(c) Find the coordinates of B.

(4)

January 2012

11. The curve C has equation

$$y = x^3 - 2x^2 - x + 9, \quad x > 0.$$

The point P has coordinates (2, 7).

(a) Show that P lies on C.

(1)

(b) Find the equation of the tangent to C at P, giving your answer in the form $y = mx + c$, where m and c are constants.

(5)

The point Q also lies on C.

Given that the tangent to C at Q is perpendicular to the tangent to C at P,

(c) show that the x-coordinate of Q is $\frac{1}{3}(2 + \sqrt{6})$.

(5)

June 2009

TOTAL FOR PAPER: 75 MARKS

END