

Core Mathematics C2 Advanced Subsidiary

For Edexcel

Paper J

Time: 1 hour 30 minutes

Instructions and Information

Candidates may use any calculator EXCEPT those with the facility for symbolic algebra, differentiation and/or integration.

Full marks may be obtained for answers to ALL questions.

The booklet 'Mathematical Formulae and Statistical Tables', available from Edexcel, may be used.

Advice to Candidates

You must show sufficient working to make your methods clear to an examiner.
Answers without working may gain no credit.

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1. The first three terms of a geometric series are k , 4 and $(5k + 11)$ respectively, where k is a constant.
- (a) Find the values of k . (5)
- (b) For $k = 1$, find the sum of the first 10 terms of the series. (2)
-
2. (a) Write down the value of
- (i) $\log_a a$,
- (ii) $\log_a 1$. (2)
- (b) Find the value of a such that
- $$\log_a 16 = \log_a 9 + 2. \quad (3)$$
- (c) Solve the equation
- $$\log_2(x + 4) - \log_2 x = 3,$$
- giving your answer as a fraction. (4)
-
3. The line joining the points $A(6, 10)$ and $B(0, 8)$ is a tangent to a circle whose centre, C , is at the point $(4, 6)$
- (a) Find the equation of the line AB . (2)
- (b) Find the equation of the line through C which is perpendicular to AB . (2)
- (c) Find the coordinates of the point of contact of the line AB with the circle. (2)
- (d) Find an equation of the circle. (3)
-
4. Find all values of θ in the interval $0 \leq \theta < 360$ for which
- (a) $\sin(\theta - 35)^\circ = 0$, (3)
- (b) $2 \sin \theta \tan \theta = 3$. (6)
-

5.

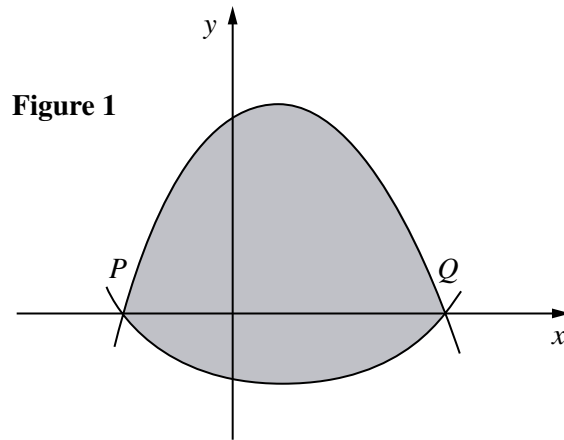


Figure 1 shows the curves $y = x^2 - x - 2$ and $y = 4 + 2x - 2x^2$.

- (a) Find the coordinates of the points P and Q where the curves intersect. (2)
- (b) Show that the area of the shaded region between the curves is $13\frac{1}{2}$. (6)

6.

$$f(x) = x^3 + ax^2 + bx - 4$$

When $f(x)$ is divided by $(x - 1)$ the remainder is -4 . Also $(x - 2)$ is a factor of $f(x)$.

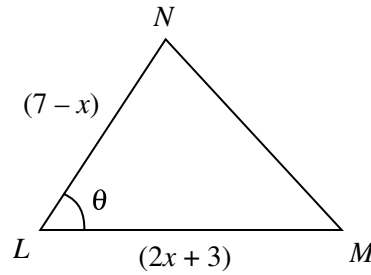
- (a) Find the value of a and the value of b . (4)
- (b) Express $f(x)$ as a product of a linear factor and a quadratic factor. (3)
- (c) Hence determine the number of real roots of the equation $f(x) = 0$. Explain your answer. (3)

7. (a) Find the first four terms in the expansion, in ascending powers of x , of $(1 + 2x)^{10}$. (3)
- (b) Show that, if terms involving x^4 and higher powers of x may be ignored,

$$(1 + 2x)^{10} + (1 - 2x)^{10} = 2 + 360x^2.$$
 (3)
- (c) Hence find the value of

$$1.000002^{10} + 0.999998^{10}$$
 correct to 12 decimal places. (4)

8.



The diagram shows triangle LMN in which the lengths of LM and LN are $(2x + 3)$ and $(7 - x)$ respectively and $\sin \theta = \frac{2}{5}$, $\theta < 90^\circ$.

(a) Show that the area A of the triangle is given by

$$A = \frac{1}{5}(21 + 11x - 2x^2) \quad (3)$$

(b) Show that the area of $\triangle LMN$ is a maximum when $x = 2\frac{3}{4}$. (5)

(c) Find the maximum area of $\triangle LMN$ (2)

(d) Find the length of NM when $x = 1$. Give your answer to 2 decimal places. (3)

END

TOTAL 75 MARKS