

## Edexcel Core 2 Jun 2008

1.

$$f(x) = 2x^3 - 3x^2 - 39x + 20$$

(a) Use the factor theorem to show that  $(x + 4)$  is a factor of  $f(x)$ .

(2)

(b) Factorise  $f(x)$  completely.

(4)

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2.

$$y = \sqrt{5^x + 2}$$

(a) Complete the table below, giving the values of  $y$  to 3 decimal places.

$x$	0	0.5	1	1.5	2
$y$			2.646	3.630	

(2)

(b) Use the trapezium rule, with all the values of  $y$  from your table, to find an approximation for the value of  $\int_0^2 \sqrt{5^x + 2} \, dx$ .

(4)

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3. (a) Find the first 4 terms, in ascending powers of  $x$ , of the binomial expansion of  $(1 + ax)^{10}$ , where  $a$  is a non-zero constant. Give each term in its simplest form.

(4)

Given that, in this expansion, the coefficient of  $x^3$  is double the coefficient of  $x^2$ ,

(b) find the value of  $a$ .

(2)

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4. (a) Find, to 3 significant figures, the value of  $x$  for which  $5^x = 7$ . (2)

(b) Solve the equation  $5^{2x} - 12(5^x) + 35 = 0$ . (4)

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5. The circle  $C$  has centre  $(3, 1)$  and passes through the point  $P(8, 3)$ .

(a) Find an equation for  $C$ . (4)

(b) Find an equation for the tangent to  $C$  at  $P$ , giving your answer in the form  $ax + by + c = 0$ , where  $a$ ,  $b$  and  $c$  are integers. (5)

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6. A geometric series has first term 5 and common ratio  $\frac{4}{5}$ .

Calculate

(a) the 20th term of the series, to 3 decimal places, (2)

(b) the sum to infinity of the series. (2)

Given that the sum to  $k$  terms of the series is greater than 24.95,

(c) show that  $k > \frac{\log 0.002}{\log 0.8}$ , (4)

(d) find the smallest possible value of  $k$ . (1)

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7.

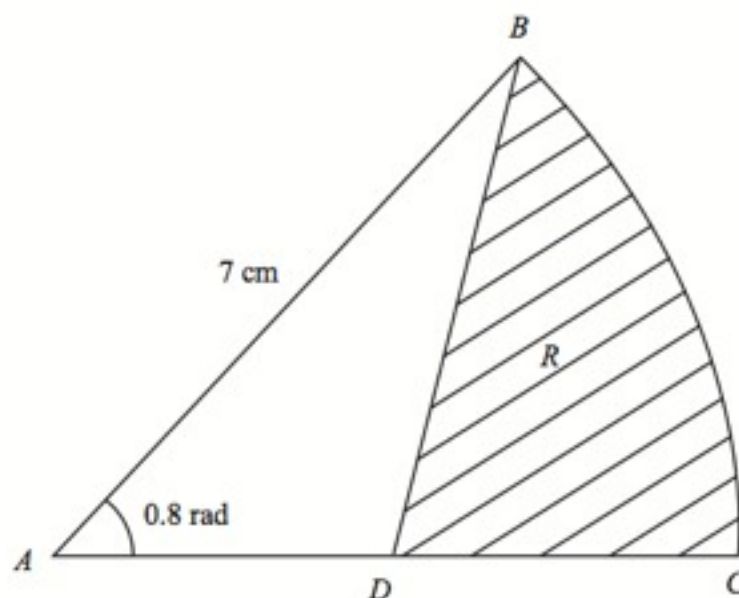


Figure 1

Figure 1 shows  $ABC$ , a sector of a circle with centre  $A$  and radius 7 cm.

Given that the size of  $\angle BAC$  is exactly 0.8 radians, find

(a) the length of the arc  $BC$ , (2)

(b) the area of the sector  $ABC$ . (2)

The point  $D$  is the mid-point of  $AC$ . The region  $R$ , shown shaded in Figure 1, is bounded by  $CD$ ,  $DB$  and the arc  $BC$ .

Find

(c) the perimeter of  $R$ , giving your answer to 3 significant figures, (4)

(d) the area of  $R$ , giving your answer to 3 significant figures. (4)

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8.

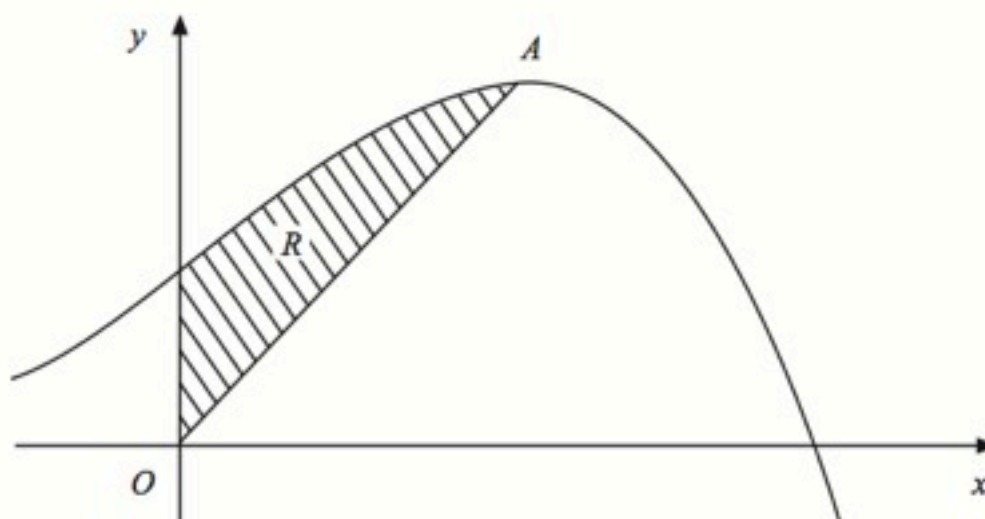


Figure 2

Figure 2 shows a sketch of part of the curve with equation  $y = 10 + 8x + x^2 - x^3$ .

The curve has a maximum turning point  $A$ .

(a) Using calculus, show that the  $x$ -coordinate of  $A$  is 2.

(3)

The region  $R$ , shown shaded in Figure 2, is bounded by the curve, the  $y$ -axis and the line from  $O$  to  $A$ , where  $O$  is the origin.

(b) Using calculus, find the exact area of  $R$ .

(8)

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9. Solve, for  $0 \leq x < 360^\circ$ ,

(a)  $\sin(x - 20^\circ) = \frac{1}{\sqrt{2}}$

(4)

(b)  $\cos 3x = -\frac{1}{2}$

(6)

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