

Edexcel Core 2 Jun 2009

1. Use calculus to find the value of

$$\int_1^4 (2x + 3\sqrt{x}) dx.$$

(5)

2. (a) Find the first 3 terms, in ascending powers of x , of the binomial expansion of

$$(2 + kx)^7$$

where k is a constant. Give each term in its simplest form.

(4)

Given that the coefficient of x^2 is 6 times the coefficient of x ,

- (b) find the value of k .

(2)

3.
$$f(x) = (3x - 2)(x - k) - 8$$

where k is a constant.

- (a) Write down the value of $f(k)$.

(1)

When $f(x)$ is divided by $(x - 2)$ the remainder is 4

- (b) Find the value of k .

(2)

- (c) Factorise $f(x)$ completely.

(3)

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4. (a) Complete the table below, giving values of $\sqrt{2^x + 1}$ to 3 decimal places.

x	0	0.5	1	1.5	2	2.5	3
$\sqrt{2^x + 1}$	1.414	1.554	1.732	1.957			3

(2)

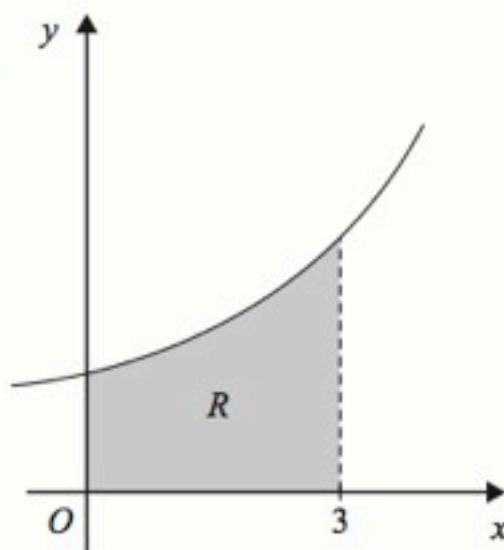


Figure 1

Figure 1 shows the region R which is bounded by the curve with equation $y = \sqrt{2^x + 1}$, the x -axis and the lines $x = 0$ and $x = 3$

- (b) Use the trapezium rule, with all the values from your table, to find an approximation for the area of R .

(4)

- (c) By reference to the curve in Figure 1 state, giving a reason, whether your approximation in part (b) is an overestimate or an underestimate for the area of R .

(2)

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5. The third term of a geometric sequence is 324 and the sixth term is 96

- (a) Show that the common ratio of the sequence is $\frac{2}{3}$ (2)
- (b) Find the first term of the sequence. (2)
- (c) Find the sum of the first 15 terms of the sequence. (3)
- (d) Find the sum to infinity of the sequence. (2)
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6. The circle C has equation

$$x^2 + y^2 - 6x + 4y = 12$$

- (a) Find the centre and the radius of C . (5)

The point $P(-1, 1)$ and the point $Q(7, -5)$ both lie on C .

- (b) Show that PQ is a diameter of C . (2)

The point R lies on the positive y -axis and the angle $PRQ = 90^\circ$.

- (c) Find the coordinates of R . (4)
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7. (i) Solve, for $-180^\circ \leq \theta < 180^\circ$,

$$(1 + \tan \theta)(5 \sin \theta - 2) = 0. \quad (4)$$

(ii) Solve, for $0 \leq x < 360^\circ$,

$$4 \sin x = 3 \tan x. \quad (6)$$

8. (a) Find the value of y such that

$$\log_2 y = -3 \quad (2)$$

(b) Find the values of x such that

$$\frac{\log_2 32 + \log_2 16}{\log_2 x} = \log_2 x \quad (5)$$

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9.

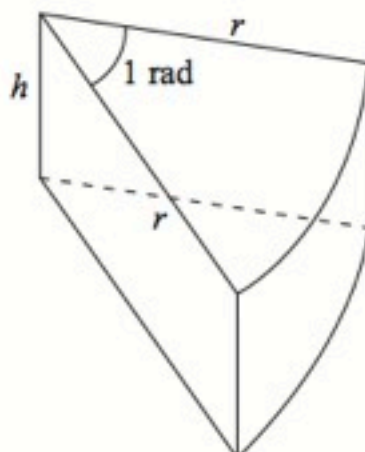


Figure 2

Figure 2 shows a closed box used by a shop for packing pieces of cake. The box is a right prism of height h cm. The cross section is a sector of a circle. The sector has radius r cm and angle 1 radian.

The volume of the box is 300 cm^3 .

(a) Show that the surface area of the box, $S \text{ cm}^2$, is given by

$$S = r^2 + \frac{1800}{r} \quad (5)$$

(b) Use calculus to find the value of r for which S is stationary. (4)

(c) Prove that this value of r gives a minimum value of S . (2)

(d) Find, to the nearest cm^2 , this minimum value of S . (2)
