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| Centre No.    |  |  |  |  |  | Paper Reference |          |          |          |          | Surname  | Initial(s) |           |
| Candidate No. |  |  |  |  |  | <b>6</b>        | <b>6</b> | <b>6</b> | <b>6</b> | <b>/</b> | <b>0</b> | <b>1</b>   | Signature |

Paper Reference(s)

**6666/01**

# Edexcel GCE Core Mathematics C4 Advanced

Friday 18 June 2010 – Afternoon

Time: 1 hour 30 minutes

Examiner's use only

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Team Leader's use only

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**Materials required for examination**  
Mathematical Formulae (Pink)

**Items included with question papers**  
Nil

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

**Instructions to Candidates**

In the boxes above, write your centre number, candidate number, your surname, initials and signature. Check that you have the correct question paper. Answer ALL the questions. You must write your answer to each question in the space following the question. When a calculator is used, the answer should be given to an appropriate degree of accuracy.

**Information for Candidates**

A booklet 'Mathematical Formulae and Statistical Tables' is provided. Full marks may be obtained for answers to ALL questions. The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2). There are 8 questions in this question paper. The total mark for this paper is 75. There are 32 pages in this question paper. Any blank pages are indicated.

**Advice to Candidates**

You must ensure that your answers to parts of questions are clearly labelled. You should show sufficient working to make your methods clear to the Examiner. Answers without working may not gain full credit.



*Turn over*

1.

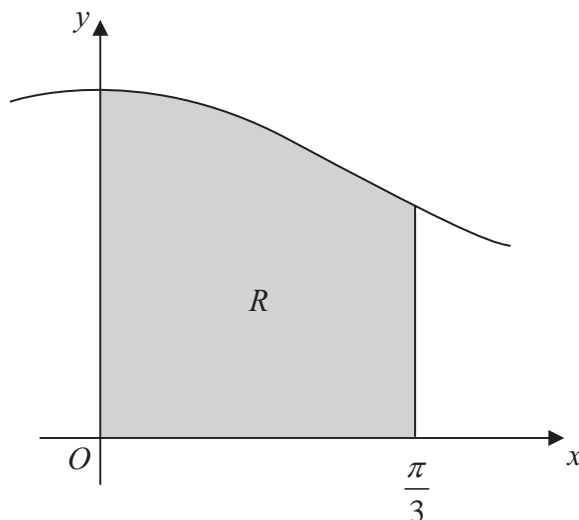


Figure 1

Figure 1 shows part of the curve with equation  $y = \sqrt{0.75 + \cos^2 x}$ . The finite region  $R$ , shown shaded in Figure 1, is bounded by the curve, the  $y$ -axis, the  $x$ -axis and the line with equation  $x = \frac{\pi}{3}$ .

(a) Complete the table with values of  $y$  corresponding to  $x = \frac{\pi}{6}$  and  $x = \frac{\pi}{4}$ .

|     |        |                  |                 |                 |                 |
|-----|--------|------------------|-----------------|-----------------|-----------------|
| $x$ | 0      | $\frac{\pi}{12}$ | $\frac{\pi}{6}$ | $\frac{\pi}{4}$ | $\frac{\pi}{3}$ |
| $y$ | 1.3229 | 1.2973           |                 |                 | 1               |

(2)

(b) Use the trapezium rule

(i) with the values of  $y$  at  $x = 0$ ,  $x = \frac{\pi}{6}$  and  $x = \frac{\pi}{3}$  to find an estimate of the area of  $R$ .

Give your answer to 3 decimal places.

(ii) with the values of  $y$  at  $x = 0$ ,  $x = \frac{\pi}{12}$ ,  $x = \frac{\pi}{6}$ ,  $x = \frac{\pi}{4}$  and  $x = \frac{\pi}{3}$  to find a

further estimate of the area of  $R$ . Give your answer to 3 decimal places.

(6)



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Question 1 continued

Lined area for writing the answer to Question 1.



2. Using the substitution  $u = \cos x + 1$ , or otherwise, show that

$$\int_0^{\frac{\pi}{2}} e^{\cos x + 1} \sin x \, dx = e(e - 1)$$

(6)

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**Question 4 continued**

Lined writing area for the answer to Question 4.









7. The line  $l_1$  has equation  $\mathbf{r} = \begin{pmatrix} 2 \\ 3 \\ -4 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix}$ , where  $\lambda$  is a scalar parameter.

The line  $l_2$  has equation  $\mathbf{r} = \begin{pmatrix} 0 \\ 9 \\ -3 \end{pmatrix} + \mu \begin{pmatrix} 5 \\ 0 \\ 2 \end{pmatrix}$ , where  $\mu$  is a scalar parameter.

Given that  $l_1$  and  $l_2$  meet at the point  $C$ , find

(a) the coordinates of  $C$ . (3)

The point  $A$  is the point on  $l_1$  where  $\lambda = 0$  and the point  $B$  is the point on  $l_2$  where  $\mu = -1$ .

(b) Find the size of the angle  $ACB$ . Give your answer in degrees to 2 decimal places. (4)

(c) Hence, or otherwise, find the area of the triangle  $ABC$ . (5)

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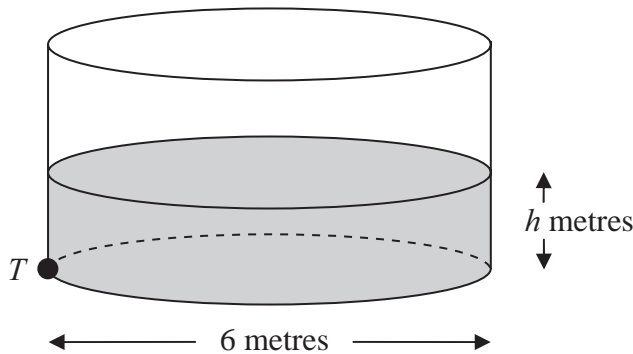
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8.



**Figure 2**

Figure 2 shows a cylindrical water tank. The diameter of a circular cross-section of the tank is 6 m. Water is flowing into the tank at a constant rate of  $0.48\pi \text{ m}^3 \text{ min}^{-1}$ . At time  $t$  minutes, the depth of the water in the tank is  $h$  metres. There is a tap at a point  $T$  at the bottom of the tank. When the tap is open, water leaves the tank at a rate of  $0.6\pi h \text{ m}^3 \text{ min}^{-1}$ .

(a) Show that  $t$  minutes after the tap has been opened

$$75 \frac{dh}{dt} = (4 - 5h) \tag{5}$$

When  $t = 0$ ,  $h = 0.2$

(b) Find the value of  $t$  when  $h = 0.5$  **(6)**

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**Question 8 continued**

Lined area for writing answers.

**(Total 11 marks)**

**TOTAL FOR PAPER: 75 MARKS**

**Q8**

**END**

