Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Area under a curve

Time allowed: 1 hour 30 minutes

Subject code **0606**

Additional Mathematics

Questions from Paper 1 and Paper 2

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.
Questions 2-5, 10 (Paper 1): no calculator.
Questions 1, 6-9 (Paper 2): calculator allowed.

Total marks

/ 57

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.
- Unless a question says otherwise, give answers that are not exact to 3 significant figures, and angles in degrees to 1 decimal place.

Information

- This paper has 10 questions worth 57 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1 $y = \dfrac{\sec^2 5x - \tan^2 5x}{\operatorname{cosec} 5x}$

Show that $y = a\sin bx$, where a and b are integers, and hence find the value of $\displaystyle\int_0^{\frac{\pi}{5}} y \, \mathrm{d}x$. [4]

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2 Find the exact value of $\int_0^{\frac{\pi}{2}} (\cos 3x + 4\sin 2x + 1)\,\mathrm{d}x$. [5]

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3 Find $\int_0^2 \left(1+e^{2x}\right)^2 dx$, giving your answer in exact form. [5]

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4 Show that $\int_{\frac{\pi}{2}}^{\frac{3\pi}{2}} \left((\sin\theta + \cos\theta)^2 + (\sin\theta - \cos\theta)^2 \right) \mathrm{d}\theta = k\pi$, where k is an integer to be found. [5]

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5 Given that $\int_0^{2a+1} \frac{8}{4x+3}\,\mathrm{d}x = \ln 16,$ find the exact value of the constant a. [5]

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6 **(i)** Find $\frac{\mathrm{d}}{\mathrm{d}x}\left(\frac{5}{3x+2}\right)$. [2]

(ii) Use your answer to part **(i)** to find $\int \frac{30}{(3x+2)^2}\,\mathrm{d}x$. [2]

(iii) Hence evaluate $\int_1^2 \frac{30}{(3x+2)^2}\,\mathrm{d}x$. [2]

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Differentiation, tangents, normals and stationary points Click for more variations

7 Find the exact value of $\int_2^4 \frac{(x+1)^2}{x^2} \mathrm{d}x$. [6]

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8 **(a)** Find $\int\left(4x+5-\frac{1}{2x+3}\right)\mathrm{d}x$. [3]

(b) Hence find the exact value of $\int_1^3\left(4x+5-\frac{1}{2x+3}\right)\mathrm{d}x$, simplifying your answer. [3]

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9 A particle travels in a straight line so that, t seconds after passing a fixed point, its velocity, $v\,\text{ms}^{-1}$, is given by

$$v = \mathrm{e}^{\frac{t}{4}} \quad \text{for } 0 \leqslant t \leqslant 4,$$

$$v = \frac{16\mathrm{e}}{t^2} \quad \text{for } 4 \leqslant t \leqslant k.$$

The total distance travelled by the particle between $t = 0$ and $t = k$ is 13.4 metres. Find the value of k. [6]

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10 **(a)** Find $\int_2^4 (5x-2)^{-\frac{2}{3}}\,\mathrm{d}x$, giving your answer in exact form. [4]

(b) Find $\int_0^{\frac{1}{2}}\left(\frac{4}{2x+1}+\frac{8}{(2x+1)^2}\right)\mathrm{d}x$, giving your answer in the form $a+\ln b$, where a and b are integers. [5]

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