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

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Integration

Time allowed: 1 hour 50 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 4, 8-10 (Paper 1): no calculator.
Questions 1-3, 5-7 (Paper 2): calculator allowed.

Total marks

/ 73

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 73 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 **(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

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

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3 **(a)** Integrate the following with respect to x.

(i) e^{5x-2} [2]

(ii) $\frac{1}{4-3x}$ where $x < \frac{4}{3}$ [2]

(b) Show that $\int_{\frac{\pi}{3}}^{\frac{\pi}{2}} \sec^2\left(\frac{1}{2}x\right) dx = 2\left(1 - \frac{\sqrt{3}}{3}\right)$. [3]

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4 It is given that $y = (3x+1)^2 \ln(3x+1)$.

(a) Find $\frac{dy}{dx}$. [3]

(b) Hence find $\int (3x+1)\ln(3x+1)\,dx$. [4]

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5 A curve is such that $\frac{dy}{dx} = (2x + 1)^{\frac{1}{2}}$. The curve passes through the point (4, 10).

(i) Find the equation of the curve. [4]

(ii) Find $\int y dx$ and hence evaluate $\int_0^{1.5} y dx$. [5]

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Integration and definite integrals Click for more variations

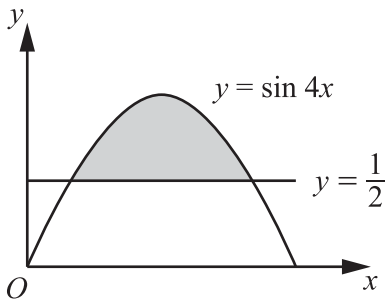
6 A curve is such that $\frac{d^2y}{dx^2} = \cos\left(4x - \frac{\pi}{4}\right)$. Given that $\frac{dy}{dx} = \frac{3}{4}$ at the point $\left(\frac{3\pi}{16}, \frac{\pi}{4}\right)$ on the curve, find the equation of the curve. [7]

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7 **(a)** Solve the equation $\sin 4x = \frac{1}{2}$ for $0 \leqslant x \leqslant \frac{\pi}{4}$, giving your answers in terms of π. [2]

(b)

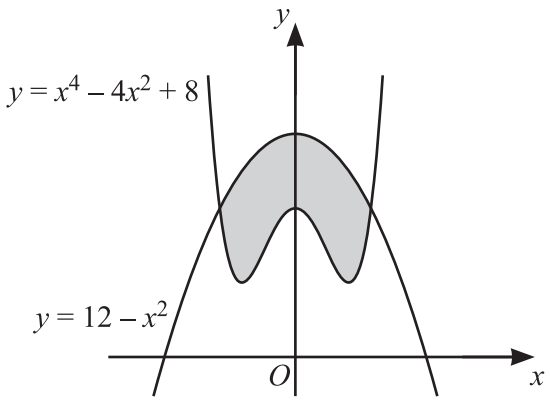


The diagram shows parts of the graphs of $y = \sin 4x$ and $y = \frac{1}{2}$.
Find the exact area of the shaded region enclosed by the curve and the line. [5]

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Areas by integration Click for more variations

8



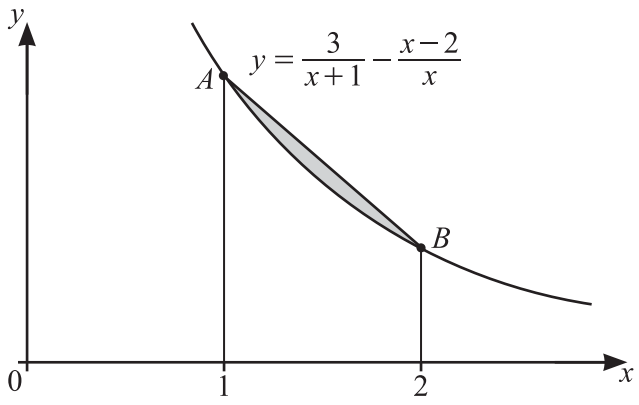
The diagram shows part of each of the curves $y = 12 - x^2$ and $y = x^4 - 4x^2 + 8$.

Find the area of the shaded region enclosed by the two curves. [7]

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The diagram shows part of the curve $y = \frac{3}{x+1} - \frac{x-2}{x}$.

The points A and B lie on the curve such that the x-coordinate of A is 1 and the x-coordinate of B is 2.

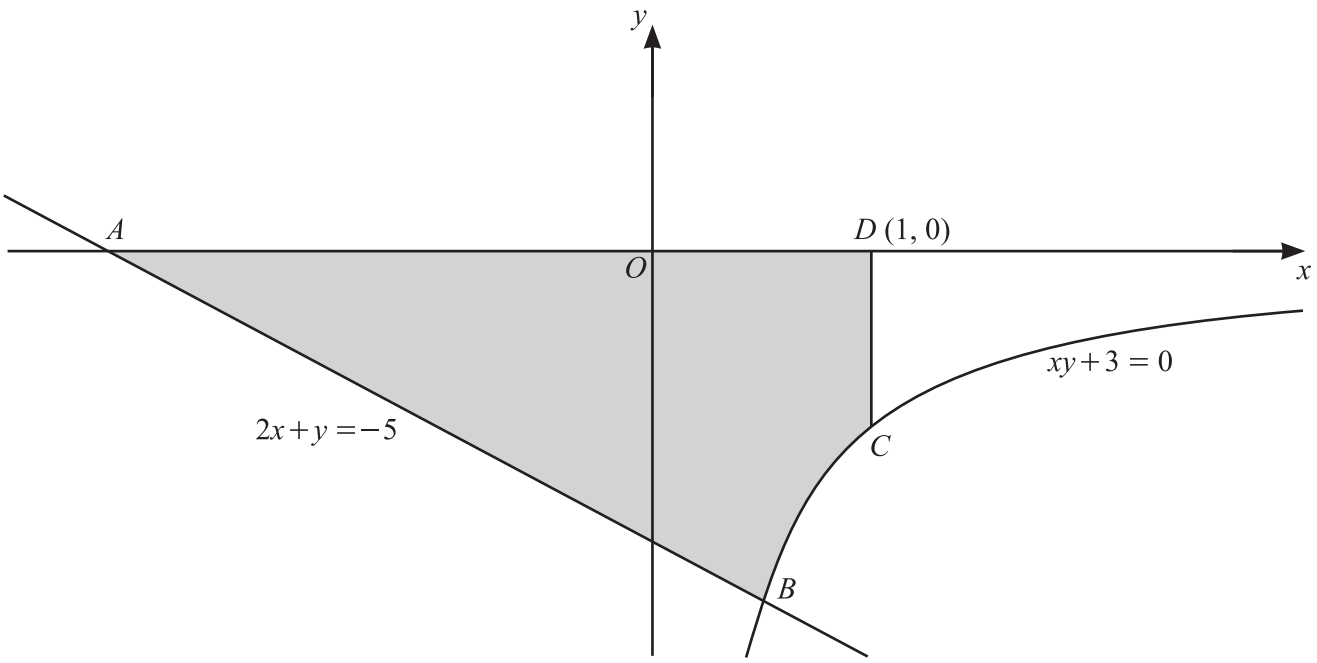
(a) Find the y-coordinates of A and B. [1]

(b) Show that the area of the shaded region enclosed by the line AB and the curve is $\frac{a}{4} - \ln\frac{b}{2}$, where a and b are integers to be found. [7]

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10



The diagram shows the straight line $2x+y=-5$ and part of the curve $xy+3=0$. The straight line intersects the x-axis at the point A and intersects the curve at the point B. The point C lies on the curve. The point D has coordinates $(1, 0)$. The line CD is parallel to the y-axis.

(a) Find the coordinates of each of the points A and B. [3]

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(b) Find the area of the shaded region, giving your answer in the form $p + \ln q$, where p and q are positive integers. [6]

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