

- 1** Given that $y = \frac{\ln x}{x^2}$, find the exact value of $\frac{dy}{dx}$ when $x = e$. [3]

A series of horizontal dotted lines for writing.

A circular logo in the bottom right corner with the text "GO AHEAD" in a stylized font. The logo is partially cut off by the edge of the page.

- 2 (a) Sketch, on the same diagram, the graphs of $y = |2x - 9|$ and $y = 5x - 3$.

[2]

- (b) Solve the equation $|2x - 9| = 5x - 3$.

[2]

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- 3** A curve has equation $e^{2x} \cos 2y + \sin y = 1$.

Find the exact gradient of the curve at the point $(0, \frac{1}{6}\pi)$.

[5]

AHEAD

- 4 (a) Use the trapezium rule with three intervals to show that the value of $\int_1^4 \ln x \, dx$ is approximately $\ln 12$. [4]

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- (b) Use a graph of $y = \ln x$ to show that $\ln 12$ is an under-estimate of the true value of $\int_1^4 \ln x \, dx$. [2]

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5 The polynomial $p(x)$ is defined by

$$p(x) = 2x^3 + ax^2 - 3x - 4,$$

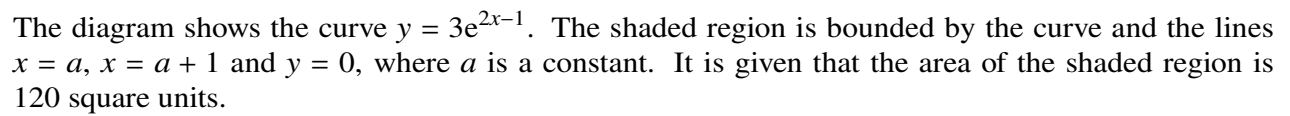
where a is a constant. It is given that $(x - 4)$ is a factor of $p(x)$.

(a) Find the value of a and hence factorise $p(x)$.

[4]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. In the bottom right corner, there is a small, dark circular logo with the word "HEAD" written in white capital letters. The rest of the page is empty.

[Turn over



- [illegible]

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- (b) Use an iterative formula, based on the equation in part (a), to find the value of a correct to 3 significant figures. Give the result of each iteration to 5 significant figures. [3]

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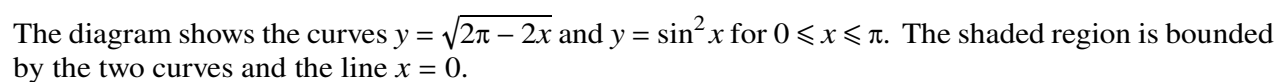
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[8]

[illegible]

- 8 (a)** Express $3 \sin 2\theta \sec \theta + 10 \cos(\theta - 30^\circ)$ in the form $R \sin(\theta + \alpha)$ where $R > 0$ and $0^\circ < \alpha < 90^\circ$.
Give the value of α correct to 2 decimal places. [6]

Handwriting practice lines on a white background. The page contains 20 horizontal dotted lines for tracing and writing practice. A small circular logo with the text 'AHEAD' is visible in the bottom right corner.



AHEAD

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. In the bottom right corner, there is a small, partially visible circular logo. The logo has a blue border and contains the word "AHEAD" in white capital letters. Below the word "AHEAD", there is a red circle, which appears to be part of a larger design or seal. The rest of the page is empty and white.



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