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- 1** Given that $2^y = 9^{3x}$, use logarithms to show that $y = kx$ and find the value of k correct to 3 significant figures. [3]

Handwriting practice lines on a page. The page contains 20 horizontal dotted lines for writing practice. A small circular logo is visible in the bottom right corner, featuring the text 'AHEAD' and a red dot.

- 2** Find the exact coordinates of the stationary point on the curve with equation $y = 5xe^{\frac{1}{2}x}$. [5]

A series of horizontal dotted lines for writing.

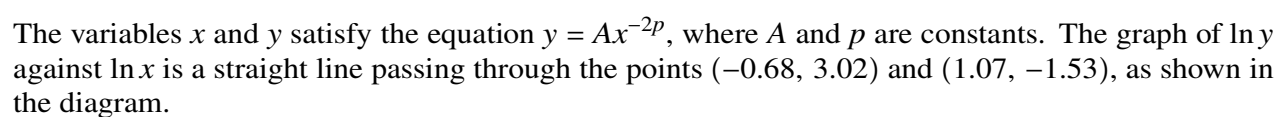


- 3** The equation of a curve is $\cos 3x + 5 \sin y = 3$.

Find the gradient of the curve at the point $(\frac{1}{9}\pi, \frac{1}{6}\pi)$.

[5]

[illegible]



[5]

[illegible]

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

- (b) Solve the inequality $3x + 5 < |2x - 3|$. [3]

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

$$p(x) = 6x^3 + ax^2 - 4x - 3,$$

where a is a constant. It is given that $(x + 3)$ is a factor of $p(x)$.

(a) Find the value of a . [2]

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(b) Using this value of a , factorise $p(x)$ completely. [3]

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[Turn over

7 It is given that $\int_0^a \left(\frac{4}{2x+1} + 8x \right) dx = 10$, where a is a positive constant.

(a) Show that $a = \sqrt{2.5 - 0.5 \ln(2a + 1)}$.

[4]

[illegible]

- (b) Using the equation in part (a), show by calculation that $1 < a < 2$.

[2]

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- (c) Use an iterative formula, based on the equation in part (a), to find the value of a correct to 4 significant figures. Give the result of each iteration to 6 significant figures.

[3]

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- 8 (a) Show that $3 \sin 2\theta \cot \theta \equiv 6 \cos^2 \theta$. [2]

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- (b) Solve the equation $3 \sin 2\theta \cot \theta = 5$ for $0 < \theta < \pi$. [3]

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(c) Find the exact value of $\int_{\frac{1}{4}\pi}^{\frac{1}{2}\pi} 3 \sin x \cot \frac{1}{2}x \, dx$.

[5]

[illegible]

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. The rest of the logo is cut off by the edge of the page.

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