



1 Solve the simultaneous equations

$$4x^2 + 2y^2 - 3y = 21 \quad \text{and} \quad 2x - y - 5 = 0. \quad [5]$$

This image shows a full page of a handwriting practice worksheet. It consists of multiple rows of horizontal dashed lines spaced evenly down the page, providing a guide for letter height and placement. The background is plain white, and there are no other markings or text present.



- $$V = 100\pi h + \frac{1}{3}\pi h^3,$$

where h is the height of water in the tank in centimetres.

Find the exact rate at which h is increasing when $h = 30$.

[3]

[illegible]



- 3 The coefficient of x^4 in the expansion of $(p + 2x)^5$ is equal to the coefficient of x^2 in the expansion of $(1 - 2qx)^4$, where p and q are constants.

(a) Find an expression for p in terms of q . [3]

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(b) Given that $p = \frac{6}{5}$, find the two possible values of the coefficient of x^3 in the expansion of $(3 + qx)^6$. [3]

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- 4 The equation of a curve is $y = -4x^2 + 2x + 3$.

- (a) Use differentiation to find the x -coordinate of the stationary point of the curve. [2]

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The curve is stretched by factor 3 in the y -direction and then by factor $\frac{1}{2}$ in the x -direction.

- (b) Find the x -coordinate of the stationary point of the transformed curve. [1]

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- (c) Find the equation of the transformed curve. Give your answer in the form $y = ax^2 + bx + c$, where a , b and c are integers to be found. [3]

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- 5 (a) Express $2x^2 - 16x - 18$ in the form $2(x+a)^2 + b$, where a and b are constants to be found. [2]

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- (b) Hence, solve the equation $2x^8 - 16x^4 - 18 = 0$. [4]

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- This image shows a full page of white paper with horizontal dashed lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



7 (a) Prove the identity

$$\frac{\cos \theta}{1 - \sin \theta} - \frac{1}{\cos \theta} = \tan \theta. \quad [4]$$

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(b) Hence, solve the equation

$$\frac{2 \cos \theta}{1 - \sin \theta} - \frac{2}{\cos \theta} + 3 = 0$$

for $0^\circ \leq \theta \leq 360^\circ$. [3]

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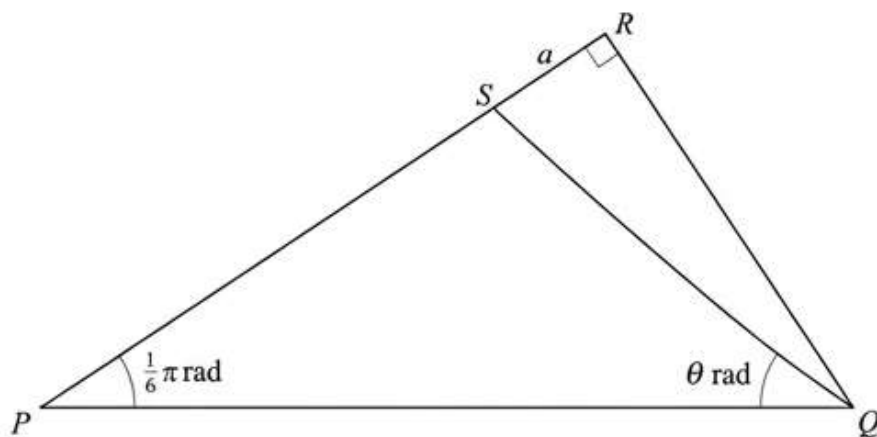
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The diagram shows a right-angled triangle PQR . The point S lies on PR and is such that $PS = 4RS$. The distance $RS = a$. The angle $QPR = \frac{1}{6}\pi$ radians, and the angle $PQS = \theta$ radians.

- (a) Find the exact distance QS in terms of a . Give your answer in the form $\sqrt{\frac{c}{d}}a$, where c and d are integers to be found. [2]

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- (b) (i) Show that the angle $RQS = \sin^{-1}\left(\frac{\sqrt{21}}{14}\right)$. [2]

(b)(i)

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- (ii) Hence, find the exact value of θ . [1]

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9 A function f is defined by $f(x) = 3 - \frac{4}{2x+3}$ for $x > -\frac{3}{2}$.

(a) (i) Find $f'(x)$.

[2]

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(ii) Hence, show that f is an increasing function.

[1]

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(b) (i) Find an expression for $f^{-1}(z)$.

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(ii) State the domain and range of f^{-1} .

[2]

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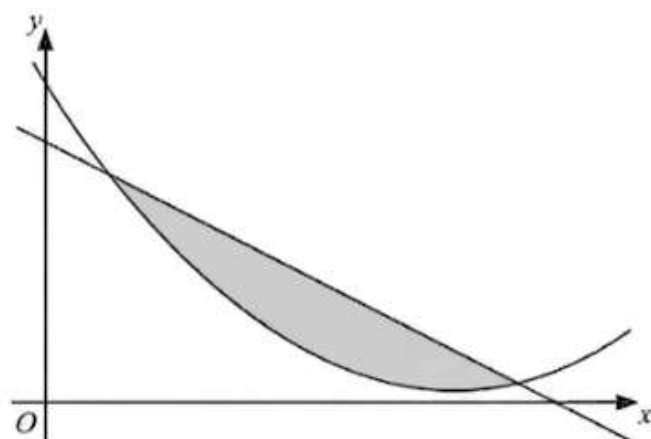
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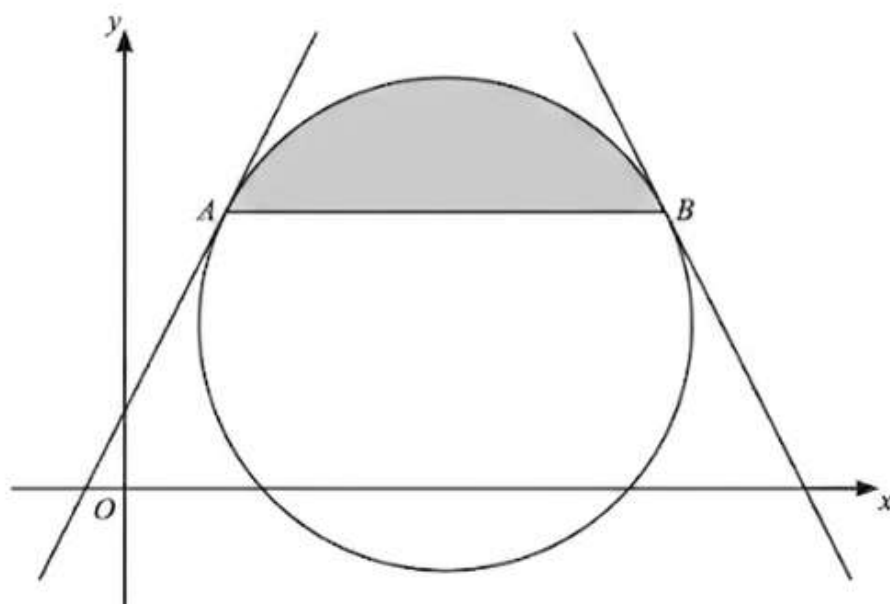
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The diagram shows the curve with equation $y = x^2 - 12x + 37$ and the line $y = -4x + 30$.

Find the area of the shaded region.

[7]



In the diagram, AB is a chord of the circle with equation $(x-6)^2 + (y-3)^2 = 20$. The two tangents to the circle with equations $y = 2x + 1$ and $y = -2x + 25$ meet the circle at the points A and B respectively.

- (a) Find the coordinates of the points A and B .

[4]

This image shows a full page of a notebook or worksheet template. It consists of approximately 20 horizontal rows. Each row is defined by two short, black dashed lines spaced evenly apart, creating a series of uniform gaps for handwriting practice. The background is plain white, and there are no margins, titles, or other markings present.



- [5]

This image shows a full page of a handwriting practice worksheet. It consists of multiple sets of three horizontal dashed lines, providing a guide for letter height and placement. The lines are evenly spaced across the entire page, which is otherwise blank.

- 12 (a) The first term of an arithmetic progression is 5730 and the common difference is -23 .

Find the value of the first negative term.

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- (b) The first term of a geometric progression is $\sin \theta$ and the second term is $\frac{1}{2} \tan \theta$, where $0 < \theta < \frac{1}{2}\pi$.

(i) Find the set of values of θ for which the progression is convergent.

[3]

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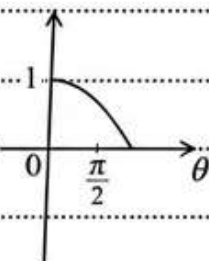
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- [illegible]



Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.

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