

Unit 3: Coordinate geometry

Subunit 3.3: Intersection of lines and curves

Topical Question No: 1

- 4** A line has equation $y = 3x + k$ and a curve has equation $y = x^2 + kx + 6$, where k is a constant.

Find the set of values of k for which the line and curve have two distinct points of intersection. [5]

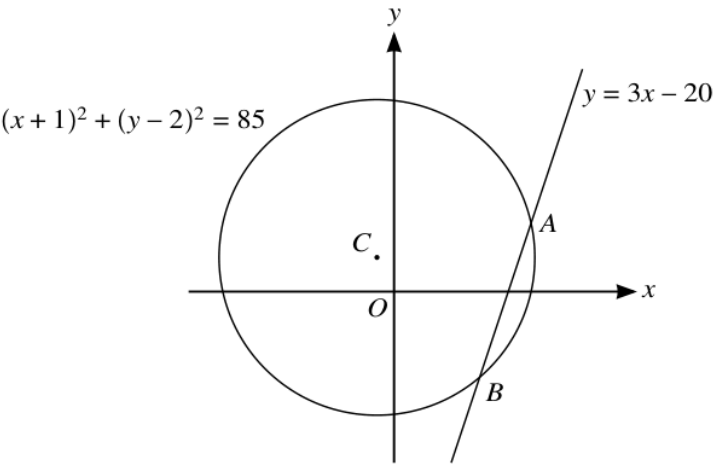
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Topical Question No: 2

- 2** A curve has equation $y = x^2 + 2cx + 4$ and a straight line has equation $y = 4x + c$, where c is a constant.

Find the set of values of c for which the curve and line intersect at two distinct points. [5]

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.



The circle with equation $(x + 1)^2 + (y - 2)^2 = 85$ and the straight line with equation $y = 3x - 20$ are shown in the diagram. The line intersects the circle at A and B, and the centre of the circle is at C.

- (a) Find, by calculation, the coordinates of A and B. [4]

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- (b) Find an equation of the circle which has its centre at C and for which the line with equation $y = 3x - 20$ is a tangent to the circle. [4]

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Topical Question No: 4

- 1** A line has equation $y = 3x - 2k$ and a curve has equation $y = x^2 - kx + 2$, where k is a constant.

Show that the line and the curve meet for all values of k .

[4]

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Topical Question No: 5

7 The straight line $y = x + 5$ meets the curve $2x^2 + 3y^2 = k$ at a single point P .

(a) Find the value of the constant k .

[4]

[illegible]

(b) Find the coordinates of P .

[2]

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Topical Question No: 6

- 1 A curve has equation $y = 5 + 3x - 2x^2$ and a straight line has equation $y = kx + 13$, where k is a constant.
- Find the set of values of k for which the curve and the line do **not** meet. [4]

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Topical Question No: 7

- 5 The equation of a line is $y = mx + c$, where m and c are constants, and the equation of a curve is $xy = 16$.

(a) Given that the line is a tangent to the curve, express m in terms of c . [3]

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- (b) Given instead that $m = -4$, find the set of values of c for which the line intersects the curve at two distinct points. [3]

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Topical Question No: 8

- 1** Find the set of values of m for which the line with equation $y = mx + 1$ and the curve with equation $y = 3x^2 + 2x + 4$ intersect at two distinct points. [4]

[illegible]

Topical Question No: 9

- 6 Points A and B have coordinates $(8, 3)$ and (p, q) respectively. The equation of the perpendicular bisector of AB is $y = -2x + 4$.

Find the values of p and q .

[4]

[illegible]

Topical Question No: 10

- 3** A line with equation $y = mx - 6$ is a tangent to the curve with equation $y = x^2 - 4x + 3$.

Find the possible values of the constant m , and the corresponding coordinates of the points at which the line touches the curve. [6]

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Topical Question No: 11

- 5** The equation of a curve is $y = 4x^2 - kx + \frac{1}{2}k^2$ and the equation of a line is $y = x - a$, where k and a are constants.
- (a)** Given that the curve and the line intersect at the points with x -coordinates 0 and $\frac{3}{4}$, find the values of k and a . [4]

[illegible]

- (b)** Given instead that $a = -\frac{7}{2}$, find the values of k for which the line is a tangent to the curve. [5]

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Topical Question No: 12

- 5 The line with equation $y = kx - k$, where k is a positive constant, is a tangent to the curve with equation $y = -\frac{1}{2x}$.

Find, in either order, the value of k and the coordinates of the point where the tangent meets the curve. [5]

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Topical Question No: 13

- 5** A circle has equation $(x - 1)^2 + (y + 4)^2 = 40$. A line with equation $y = x - 9$ intersects the circle at points A and B .

(a) Find the coordinates of the two points of intersection. [4]

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

(b) Find an equation of the circle with diameter AB . [3]

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