Coordinate Geometry – 2022 AS Nov

1. March/2022/Paper_9709/12/No.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]

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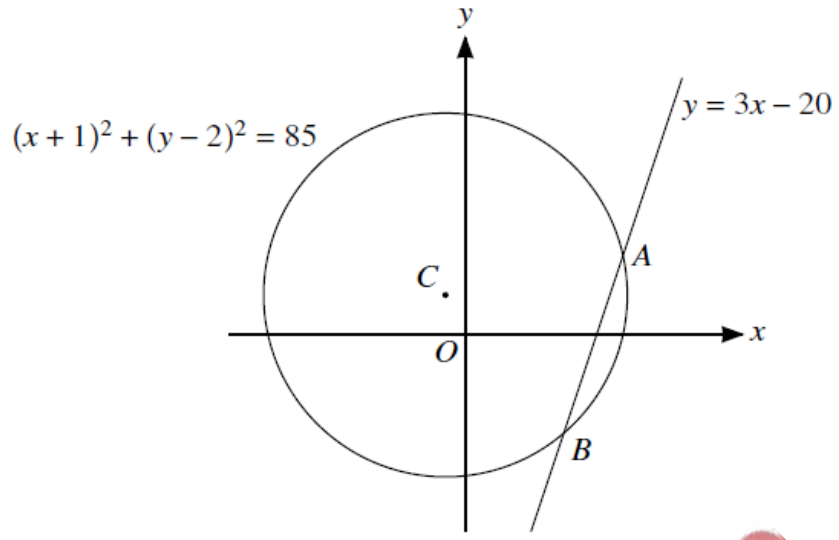
2. March/2022/Paper_9709/12/No.6



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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3. June/2022/Paper_9709/11/No.9

The equation of a circle is $x^2 + y^2 + 6x - 2y - 26 = 0$.

(a) Find the coordinates of the centre of the circle and the radius. Hence find the coordinates of the lowest point on the circle. [4]

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(b) Find the set of values of the constant k for which the line with equation $y = kx - 5$ intersects the circle at two distinct points. [6]

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4. June/2022/Paper_9709/12/No.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]

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(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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5. June/2022/Paper_9709/12/No.8

The equation of a circle is $x^2 + y^2 + ax + by - 12 = 0$. The points $A\,(1,\ 1)$ and $B\,(2,\ -6)$ lie on the circle.

(a) Find the values of a and b and hence find the coordinates of the centre of the circle. [4]

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(b) Find the equation of the tangent to the circle at the point A, giving your answer in the form $px + qy = k$, where p, q and k are integers. [4]

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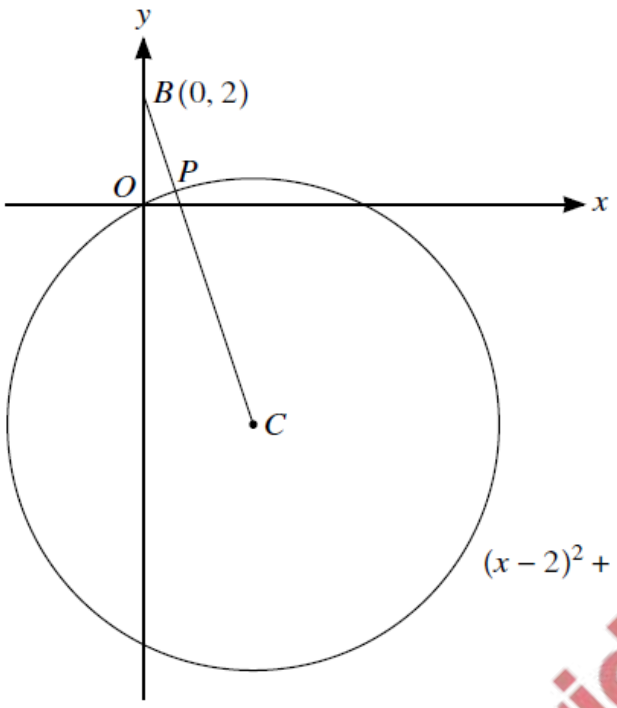
6. June/2022/Paper_9709/13/No.7



$(x-2)^2 + (y+4)^2 = 20$

The diagram shows the circle with equation $(x-2)^2 + (y+4)^2 = 20$ and with centre C. The point B has coordinates $(0, 2)$ and the line segment BC intersects the circle at P.

(a) Find the equation of BC. [2]

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(b) Hence find the coordinates of P, giving your answer in exact form. [5]

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7. June/2022/Paper_9709/13/No.11

The point P lies on the line with equation $y = mx + c$, where m and c are positive constants. A curve has equation $y = -\frac{m}{x}$. There is a single point P on the curve such that the straight line is a tangent to the curve at P.

(a) Find the coordinates of P, giving the y-coordinate in terms of m. [6]

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The normal to the curve at P intersects the curve again at the point Q.

(b) Find the coordinates of Q in terms of m. [4]

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