1. Nov/2023/Paper_9709/11/No.2

A line has equation $y = 2cx + 3$ and a curve has equation $y = cx^2 + 3x - c$, where c is a constant.

Showing all necessary working, determine which of the following statements is correct.

A   The line and curve intersect only for a particular set of values of c.

B   The line and curve intersect for all values of c.

C   The line and curve do not intersect for any values of c.   [4]

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The diagram shows the circle with equation $(x - 4)^2 + (y + 1)^2 = 40$. Parallel tangents, each with gradient 1, touch the circle at points A and B.

(a) Find the equation of the line AB, giving the answer in the form $y = mx + c$. [3]

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(b) Find the coordinates of A, giving each coordinate in surd form. [4]

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(c) Find the equation of the tangent at A, giving the answer in the form $y = mx + c$, where c is in surd form. [2]

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The coordinates of points A, B and C are $(6, 4)$, $(p, 7)$ and $(14, 18)$ respectively, where p is a constant. The line AB is perpendicular to the line BC.

(a) Given that $p < 10$, find the value of p. [4]

A circle passes through the points *A*, *B* and *C*.

(b) Find the equation of the circle. [3]

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(c) Find the equation of the tangent to the circle at *C*, giving the answer in the form $dx + ey + f = 0$, where *d*, *e* and *f* are integers. [3]
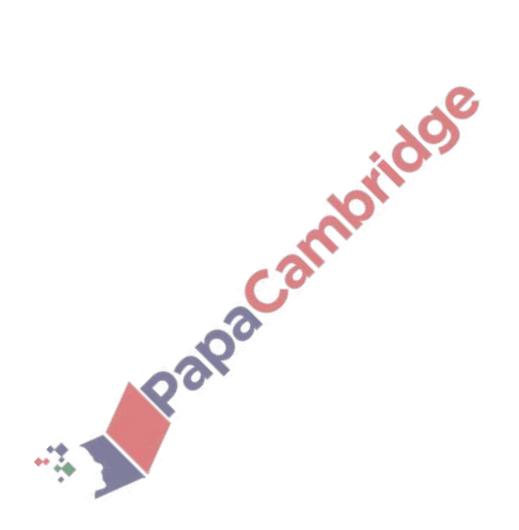
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The circle with equation $(x - 3)^2 + (y - 5)^2 = 40$ intersects the y-axis at points A and B.

(a) Find the y-coordinates of A and B, expressing your answers in terms of surds. [2]

(b) Find the equation of the circle which has AB as its diameter. [2]

5.

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]

Points A (7, 12) and B lie on a circle with centre $(-2, 5)$. The line AB has equation $y = -2x + 26$.

Find the coordinates of B. [6]