



Maths Questions By Topic:

**Coordinate geometry in the (x, y)
plane**

A-Level Edexcel

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2.

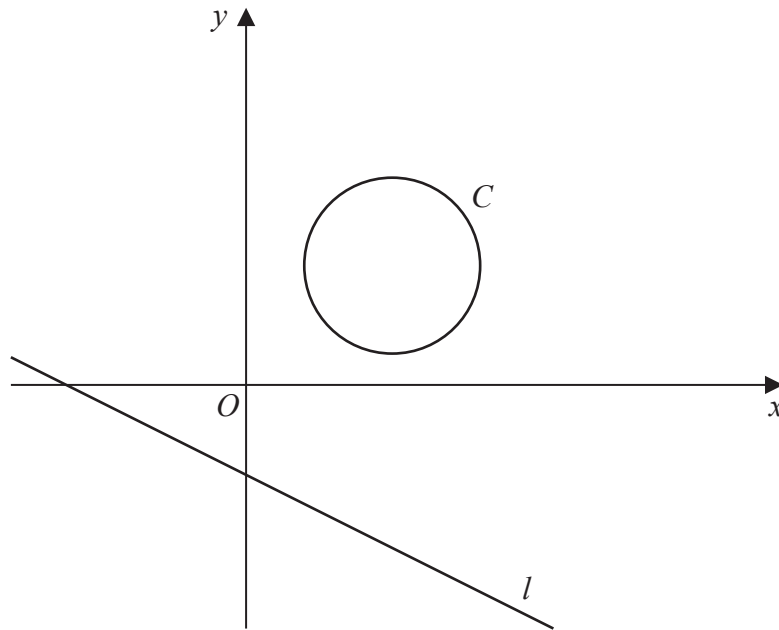


Figure 3

Figure 3 shows the circle C with equation

$$x^2 + y^2 - 10x - 8y + 32 = 0$$

and the line l with equation

$$2y + x + 6 = 0$$

(a) Find

- (i) the coordinates of the centre of C ,
- (ii) the radius of C .

(3)

(b) Find the shortest distance between C and l .

(5)

27.

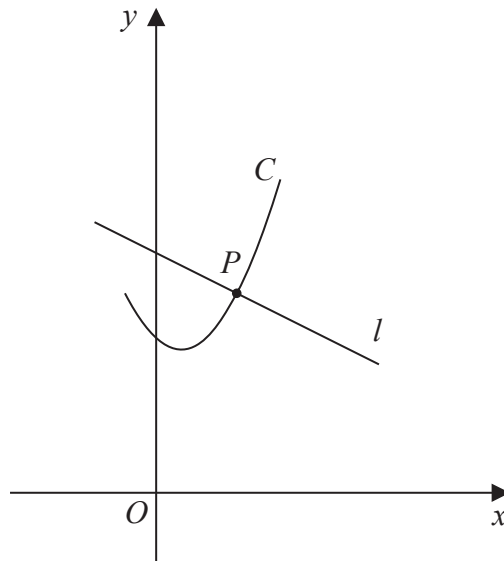


Figure 6

Figure 6 shows a sketch of the curve C with parametric equations

$$x = 2 \tan t + 1 \quad y = 2 \sec^2 t + 3 \quad -\frac{\pi}{4} \leq t \leq \frac{\pi}{3}$$

The line l is the normal to C at the point P where $t = \frac{\pi}{4}$

(a) Using parametric differentiation, show that an equation for l is

$$y = -\frac{1}{2}x + \frac{17}{2} \quad (5)$$

(b) Show that all points on C satisfy the equation

$$y = \frac{1}{2}(x-1)^2 + 5 \quad (2)$$

The straight line with equation

$$y = -\frac{1}{2}x + k \quad \text{where } k \text{ is a constant}$$

intersects C at two distinct points.

(c) Find the range of possible values for k . (5)

33.

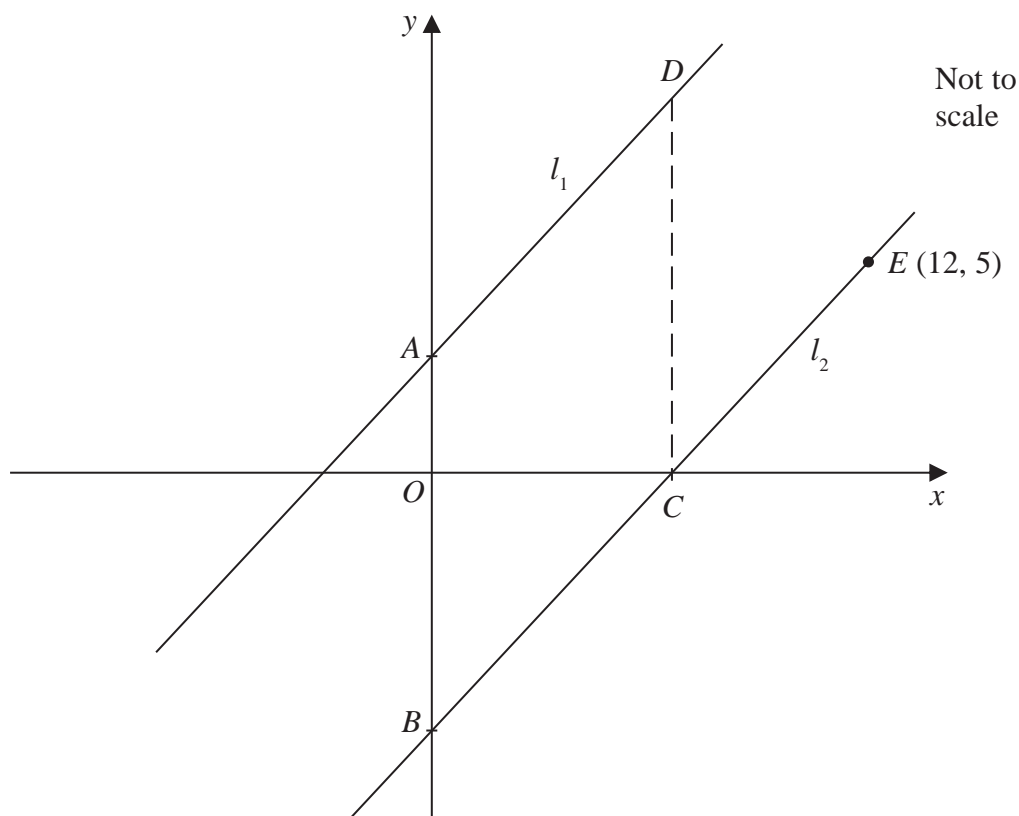


Figure 2

Figure 2 shows the straight line l_1 with equation $4y = 5x + 12$

- (a) State the gradient of l_1 (1)

The line l_2 is parallel to l_1 and passes through the point $E(12, 5)$, as shown in Figure 2.

- (b) Find the equation of l_2 . Write your answer in the form $y = mx + c$, where m and c are constants to be determined. (3)

The line l_2 cuts the x -axis at the point C and the y -axis at the point B .

- (c) Find the coordinates of (2)
- (i) the point B ,
 - (ii) the point C .

The line l_1 cuts the y -axis at the point A .

The point D lies on l_1 such that $ABCD$ is a parallelogram, as shown in Figure 2.

- (d) Find the area of $ABCD$. (2)

36.

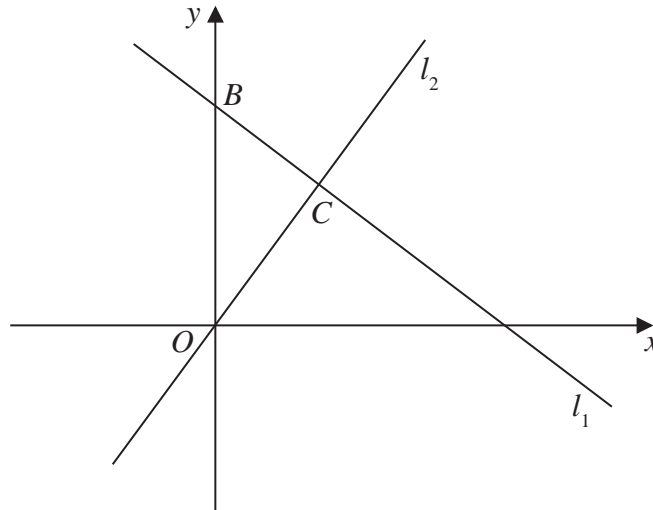


Figure 2

The line l_1 , shown in Figure 2 has equation $2x + 3y = 26$

The line l_2 passes through the origin O and is perpendicular to l_1

(a) Find an equation for the line l_2 (4)

The line l_2 intersects the line l_1 at the point C .

Line l_1 crosses the y -axis at the point B as shown in Figure 2.

(b) Find the area of triangle OBC .
 Give your answer in the form $\frac{a}{b}$, where a and b are integers to be determined. (6)

37.

Diagram NOT to scale

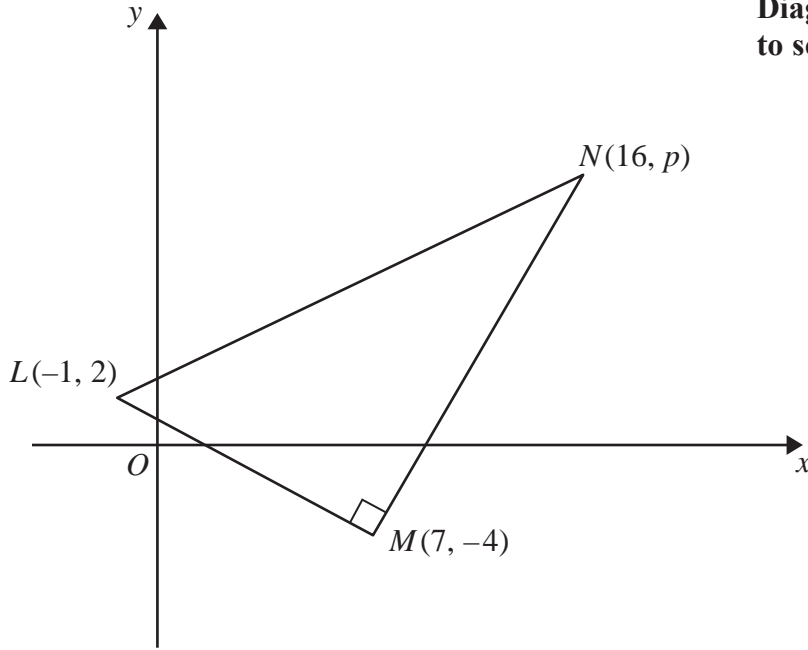


Figure 2

Figure 2 shows a right angled triangle LMN .

The points L and M have coordinates $(-1, 2)$ and $(7, -4)$ respectively.

- (a) Find an equation for the straight line passing through the points L and M .

Give your answer in the form $ax + by + c = 0$, where a , b and c are integers.

(4)

Given that the coordinates of point N are $(16, p)$, where p is a constant, and angle $LMN = 90^\circ$,

- (b) find the value of p .

(3)

Given that there is a point K such that the points L , M , N , and K form a rectangle,

- (c) find the y coordinate of K .

(2)

53. The circle C has equation

$$x^2 + y^2 - 10x + 6y + 30 = 0$$

Find

- (a) the coordinates of the centre of C , **(2)**

- (b) the radius of C , **(2)**

- (c) the y coordinates of the points where the circle C crosses the line with equation $x = 4$,
giving your answers as simplified surds. **(3)**

54.

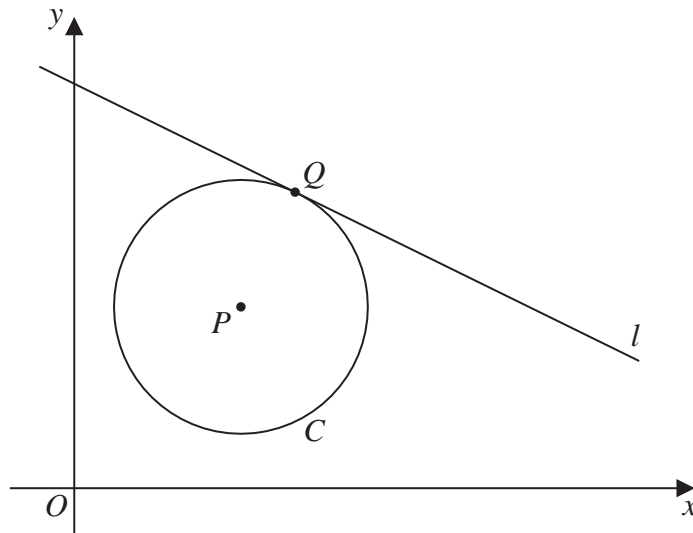


Diagram not drawn to scale

Figure 2

The circle C has centre $P(7, 8)$ and passes through the point $Q(10, 13)$, as shown in Figure 2.

(a) Find the length PQ , giving your answer as an exact value. **(2)**

(b) Hence write down an equation for C . **(2)**

The line l is a tangent to C at the point Q , as shown in Figure 2.

(c) Find an equation for l , giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. **(4)**

55. A circle C with centre at the point $(2, -1)$ passes through the point A at $(4, -5)$.

(a) Find an equation for the circle C .

(3)

(b) Find an equation of the tangent to the circle C at the point A , giving your answer in the form $ax + by + c = 0$, where a , b and c are integers.

(4)

(Total 7 marks)

56.

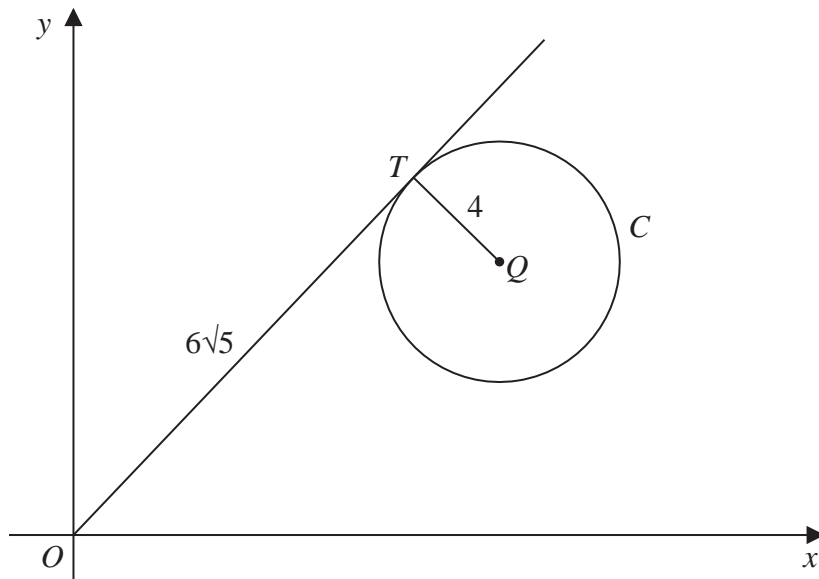


Figure 3

Figure 3 shows a circle C with centre Q and radius 4 and the point T which lies on C .

The tangent to C at the point T passes through the origin O and $OT = 6\sqrt{5}$

Given that the coordinates of Q are $(11, k)$, where k is a positive constant,

(a) find the exact value of k , (3)

(b) find an equation for C . (2)

57. The circle C , with centre A , passes through the point P with coordinates $(-9, 8)$ and the point Q with coordinates $(15, -10)$.

Given that PQ is a diameter of the circle C ,

(a) find the coordinates of A , **(2)**

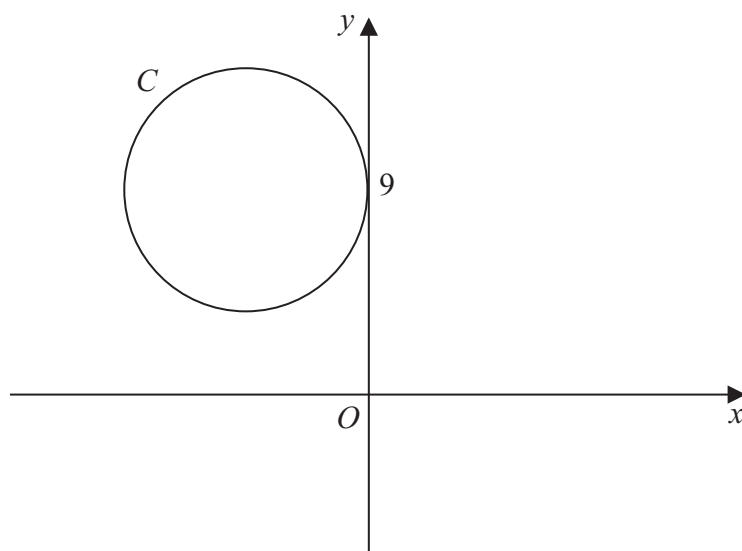
(b) find an equation for C . **(3)**

A point R also lies on the circle C .
Given that the length of the chord PR is 20 units,

(c) find the length of the shortest distance from A to the chord PR .
Give your answer as a surd in its simplest form. **(2)**

(d) Find the size of the angle ARQ , giving your answer to the nearest 0.1 of a degree. **(2)**

58.

**Figure 4**

The circle C has radius 5 and touches the y -axis at the point $(0, 9)$, as shown in Figure 4.

- (a) Write down an equation for the circle C , that is shown in Figure 4. (3)

A line through the point $P(8, -7)$ is a tangent to the circle C at the point T .

- (b) Find the length of PT . (3)

59. The circle C has equation

$$x^2 + y^2 - 20x - 24y + 195 = 0$$

The centre of C is at the point M .

(a) Find

- (i) the coordinates of the point M ,
- (ii) the radius of the circle C .

(5)

N is the point with coordinates $(25, 32)$.

(b) Find the length of the line MN .

(2)

The tangent to C at a point P on the circle passes through point N .

(c) Find the length of the line NP .

(2)

60.

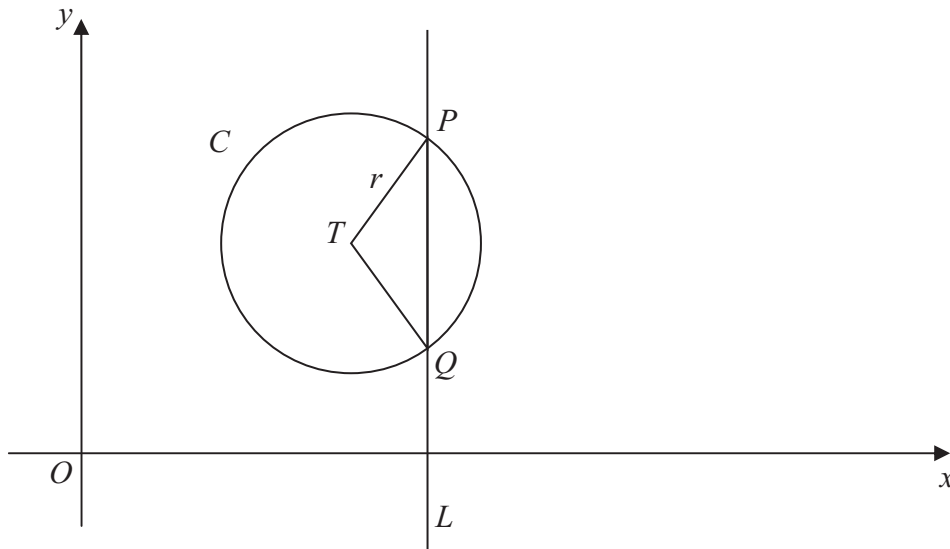


Figure 1

The circle C with centre T and radius r has equation

$$x^2 + y^2 - 20x - 16y + 139 = 0$$

(a) Find the coordinates of the centre of C . (3)

(b) Show that $r = 5$ (2)

The line L has equation $x = 13$ and crosses C at the points P and Q as shown in Figure 1.

(c) Find the y coordinate of P and the y coordinate of Q . (3)

Given that, to 3 decimal places, the angle PTQ is 1.855 radians,

(d) find the perimeter of the sector PTQ . (3)

62. The circle C has equation $x^2 + y^2 + 4x - 2y - 11 = 0$

Find

(a) the coordinates of the centre of C , (2)

(b) the radius of C , (2)

(c) the coordinates of the points where C crosses the y -axis, giving your answers as simplified surds. (4)

(Total 8 marks)

63. The points A and B have coordinates $(-2, 11)$ and $(8, 1)$ respectively.

Given that AB is a diameter of the circle C ,

- (a) show that the centre of C has coordinates $(3, 6)$, (1)
- (b) find an equation for C . (4)
- (c) Verify that the point $(10, 7)$ lies on C . (1)
- (d) Find an equation of the tangent to C at the point $(10, 7)$, giving your answer in the form $y = mx + c$, where m and c are constants. (4)

Question 63 continued

Handwriting practice area consisting of 30 horizontal lines.

(Total 10 marks)

64. The circle C has centre $A(2, 1)$ and passes through the point $B(10, 7)$.

(a) Find an equation for C . (4)

The line l_1 is the tangent to C at the point B .

(b) Find an equation for l_1 . (4)

The line l_2 is parallel to l_1 and passes through the mid-point of AB .

Given that l_2 intersects C at the points P and Q ,

(c) find the length of PQ , giving your answer in its simplest surd form. (3)

65.

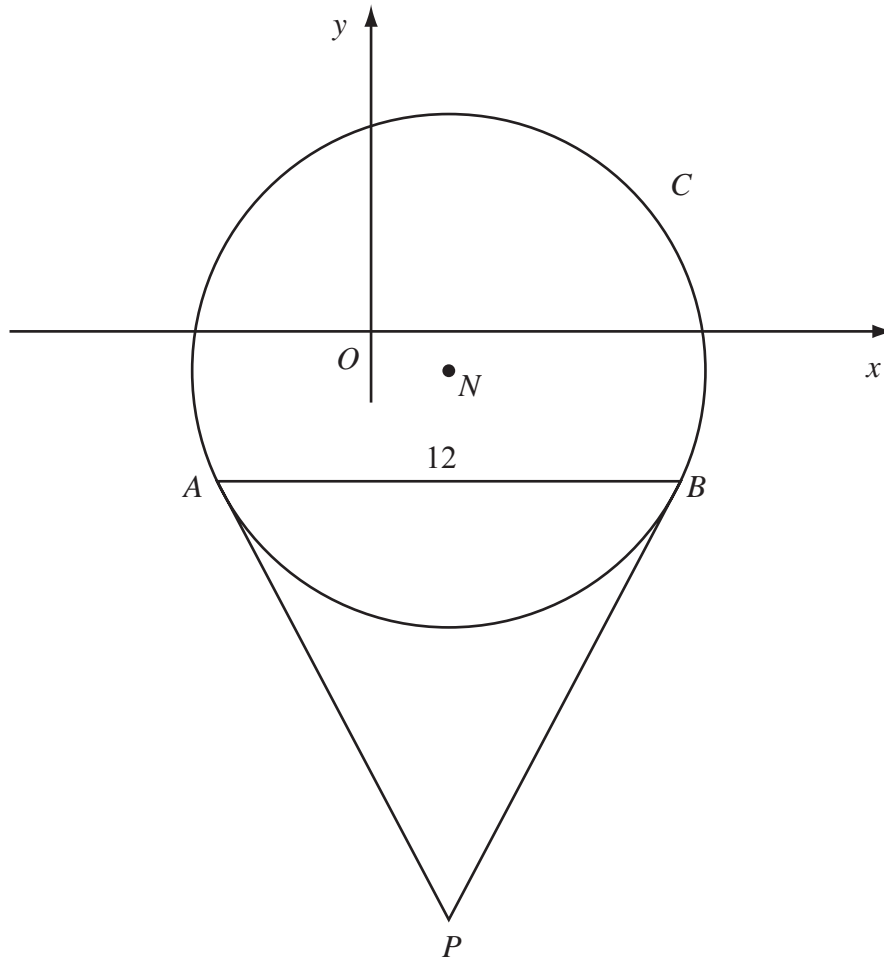


Figure 3

Figure 3 shows a sketch of the circle C with centre N and equation

$$(x - 2)^2 + (y + 1)^2 = \frac{169}{4}$$

(a) Write down the coordinates of N . (2)

(b) Find the radius of C . (1)

The chord AB of C is parallel to the x -axis, lies below the x -axis and is of length 12 units as shown in Figure 3.

(c) Find the coordinates of A and the coordinates of B . (5)

(d) Show that angle $ANB = 134.8^\circ$, to the nearest 0.1 of a degree. (2)

The tangents to C at the points A and B meet at the point P .

(e) Find the length AP , giving your answer to 3 significant figures. (2)

66. The circle C has equation

$$x^2 + y^2 - 6x + 4y = 12$$

(a) Find the centre and the radius of C . (5)

The point $P(-1, 1)$ and the point $Q(7, -5)$ both lie on C .

(b) Show that PQ is a diameter of C . (2)

The point R lies on the positive y -axis and the angle $PRQ = 90^\circ$.

(c) Find the coordinates of R . (4)

67.

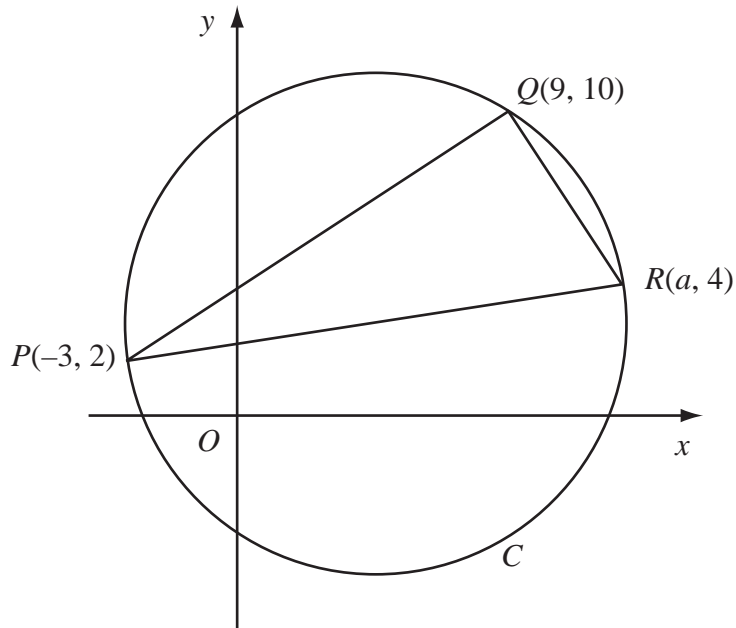


Figure 2

The points $P(-3, 2)$, $Q(9, 10)$ and $R(a, 4)$ lie on the circle C , as shown in Figure 2. Given that PR is a diameter of C ,

(a) show that $a = 13$, (3)

(b) find an equation for C . (5)

Question 69 continued

Lined writing area for the answer to Question 69.

(Total 11 marks)

70.

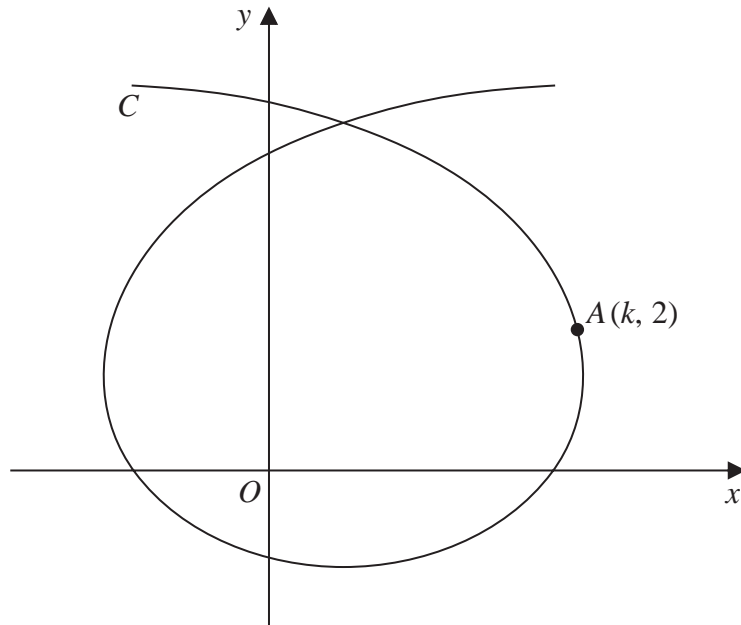


Diagram not drawn to scale

Figure 2

Figure 2 shows a sketch of the curve C with parametric equations

$$x = 1 + t - 5 \sin t, \quad y = 2 - 4 \cos t, \quad -\pi \leq t \leq \pi$$

The point A lies on the curve C .

Given that the coordinates of A are $(k, 2)$, where $k > 0$

(a) find the exact value of k , giving your answer in a fully simplified form. (2)

(b) Find the equation of the tangent to C at the point A .
Give your answer in the form $y = px + q$, where p and q are exact real values. (5)

71.

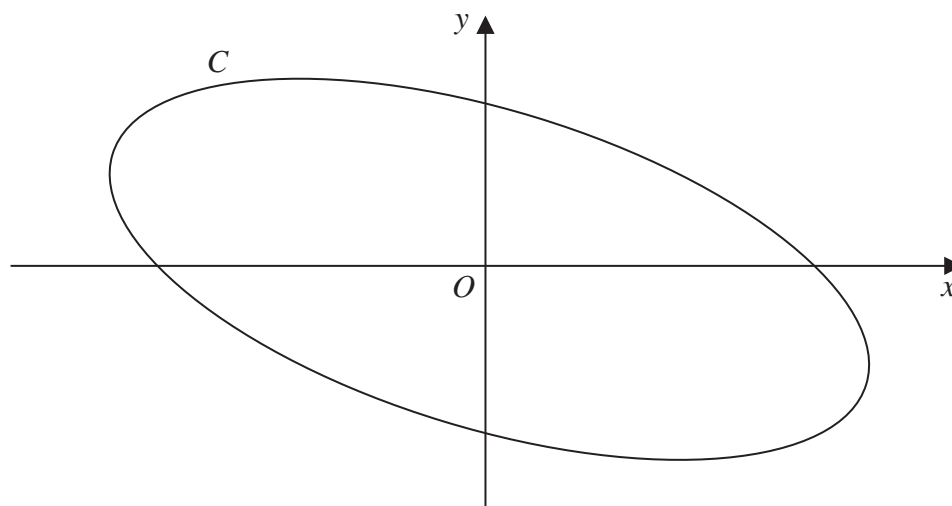


Figure 3

Figure 3 shows a sketch of the curve C with parametric equations

$$x = 4\cos\left(t + \frac{\pi}{6}\right), \quad y = 2\sin t, \quad 0 \leq t < 2\pi$$

(a) Show that

$$x + y = 2\sqrt{3} \cos t \tag{3}$$

(b) Show that a cartesian equation of C is

$$(x + y)^2 + ay^2 = b$$

where a and b are integers to be determined.

(2)

72.

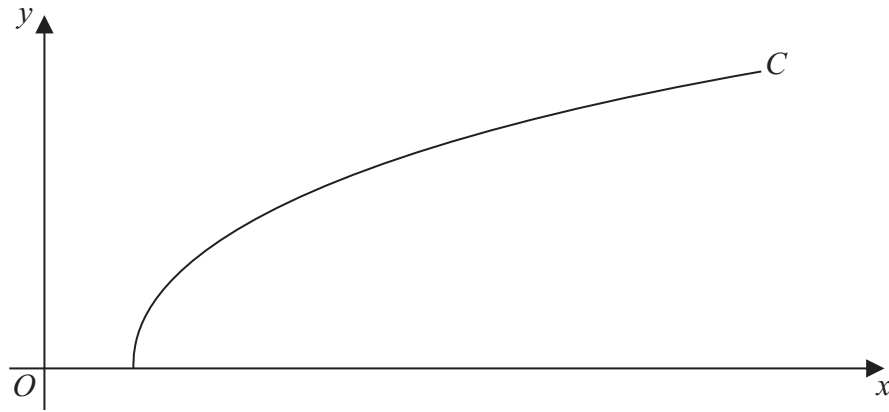


Figure 2

Figure 2 shows a sketch of the curve C with parametric equations

$$x = 27 \sec^3 t, \quad y = 3 \tan t, \quad 0 \leq t \leq \frac{\pi}{3}$$

Show that the cartesian equation of C may be written in the form

$$y = (x^{\frac{2}{3}} - 9)^{\frac{1}{2}}, \quad a \leq x \leq b$$

stating the values of a and b .

(3)

74.

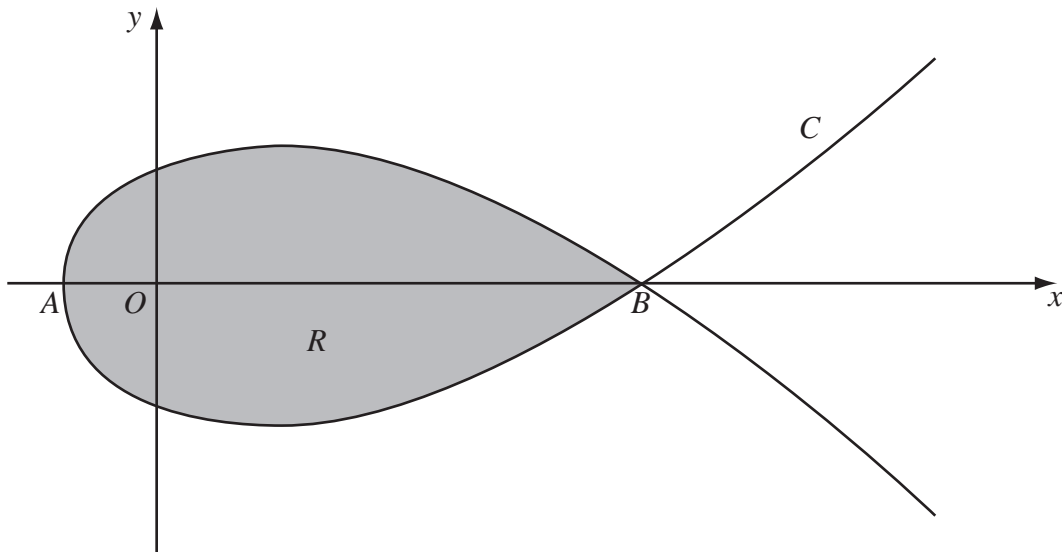


Figure 2

Figure 2 shows a sketch of the curve C with parametric equations

$$x = 5t^2 - 4, \quad y = t(9 - t^2)$$

The curve C cuts the x -axis at the points A and B .

Find the x -coordinate at the point A and the x -coordinate at the point B . (3)

(Total 3 marks)